

DRAFT

**INTERIM DATA REPORT
SITE-SPECIFIC ENVIRONMENTAL
BASELINE SURVEY
ST. LOUIS ARMY AMMUNITION
PLANT
ST. LOUIS, MISSOURI
CONTRACT NO. DACW41-96-D-8014
TASK ORDER 0019**

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URS

URS Group, Inc.
10975 EL MONTE, SUITE 100
OVERLAND PARK, KANSAS 66211

Job No. 16529173

40330501



Superfund

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LIST OF ABBREVIATIONS, ACRONYMS, AND TERMS

ACM	Asbestos Containing Material
AMCCOM	U.S. Army Armament, Munitions, and Chemical Command
AMCOM	U.S. Army Aviation and Missile Command
Arrowhead	Arrowhead Contracting, Inc.
AST	Aboveground Storage Tank
ASTM	American Society for Testing and Materials
ATCOM	U.S. Army Aviation and Troop Command
AVSCOM	U.S. Army Aviation Systems Command
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
bgs	Below ground surface
BRAC	Base Realignment and Closure
CALM	Cleanup Levels for Missouri
CENWK	U.S. Army Corps of Engineers, Kansas City District
CEWES	U.S. Army Corps of Engineers Waterways Experiment Station Environmental Laboratory, Omaha, Nebraska
EBS	Environmental Baseline Survey
EDR	Environmental Data Resources, Inc.
EPA	U.S. Environmental Protection Agency
FOST	Finding of Suitability to Transfer
FSP	Field Sampling Plan
gpm	Gallons per minute
HHBRA	Human Health Baseline Risk Assessment
IDR	Interim Data Report
IDW	Investigation Derived Waste
L	Liter
LBP	Lead-Based Paint
MDHSS	Missouri Department of Health and Senior Services
MDNR	Missouri Department of Natural Resources
mm	Millimeter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
msl	Mean sea level
MW	Monitoring Well
NON	Notice of Noncompliance
ODESCO	ODESCO Industrial Services, Inc.
PAHs	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PFE	Plant Facilities and Engineering, Inc.
PRGs	Preliminary Remediation Goals
PURO	PURO Chemical Division
QA	Quality Assurance
QC	Quality Control
SAP	Sampling and Analysis Plan
SEMCOR	Titan Systems Corporation, SEMCOR Division
SLAAP	St. Louis Army Ammunition Plant
SLOP	St. Louis Ordnance Plant

LIST OF ABBREVIATIONS, ACRONYMS, AND TERMS

SSEBS	Site-Specific Environmental Baseline Survey
SVOCs	Semi-Volatile Organic Compounds
TPH	Total Petroleum Hydrocarbons
TPH-DRO	Total Petroleum Hydrocarbons - Diesel Range Organics
TTEMI	Tetra Tech EM, Inc.
URS	URS Group, Inc.
USACE	U.S. Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USATHMA	U.S. Army Toxic and Hazardous Materials Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1.1 PURPOSE OF REPORT

The purpose of this Interim Data Report (IDR) for the Site-Specific Environmental Baseline Survey (SSEBS) is to present the analytical data generated from the August/September 2002 Field Sampling Event at the St. Louis Army Ammunition Plant (SLAAP).

The SSEBS in conjunction with the Human Health Baseline Risk Assessment (HHBRA) will provide an analysis of the nature and extent of any contamination present on the site and an assessment of the risks posed to human health by such contamination, including the potential for future releases. The SSEBS and HHBRA will be used to support the Army in the Finding of Suitability to Transfer (FOST) determination process.

This document was prepared by URS Group, Inc. (URS) on behalf of the U.S. Army Corps of Engineers (USACE), Kansas City District (CENWK) and the Base Realignment and Closure (BRAC) Headquarters, Fort McPherson, Georgia under URS Contract number DACW41-96-D-8014, Task Order 0019.

1.2 REPORT ORGANIZATION

This report presents analytical results from samples collected during the August/September 2002 sampling event at SLAAP. These results will be used in conjunction with additional data to assess the nature and extent of contamination at the site and level of human health risk associated with this contamination. These issues will be addressed in the Draft SSEBS and Draft HHBRA scheduled to be submitted under separate covers after completion of the Contingency Sampling Plan. Following is a general outline of this IDR.

Section 1.3 includes a brief description and history of the Site including results from relevant previous investigations. Section 1.4 provides description and history of each individual investigation area. Section 2.0, Site-Specific Investigations, is structured similarly to the Sampling and Analysis Plan (SAP) – Part I, Field Sampling Plan (FSP) (URS, 2002). The descriptions are organized by investigation areas and include location and quantity of samples and any deviations from, or elaboration to, the detail provided in the FSP. Section 3.0 provides background data and information about the Site from literature sources and investigation documentation on topography, geology, hydrogeology, climate, ecology, and land use. Section 4.0 presents the analytical results for the samples collected during the August/September 2002 sampling event in each investigation area, including regional background investigations. Section 5.0 describes the additional field activities and analysis necessary to complete the SSEBS and HHBRA. Section 6.0 cites the various publications referenced in this report.

Tables include a summary of previous investigation results (**Table 1-1**), a summary of the analytical methods used by the laboratories (**Table 2-1**), summaries of chemical analyses organized by investigation area (**Table 2-2**), water level measurements and groundwater elevations from the August/September 2002 sampling event (**Table 2-3**), screening levels (**Tables 4-1 through 4-3**), summaries of results above those screening levels organized by investigation area and sample medium (**Tables 4-4 through 4-21**) and a summary of chemical analyses for the Contingency Sampling Program (**Table 5-1**). **Figure 2-1** depicts the sampling locations for each investigation area. **Figure 5-1** presents the contingency sampling locations.

Appendix A includes ten tables containing the complete analytical results for all investigation samples collected during the August/September sampling event.

1.3 SITE BACKGROUND

1.3.1 Site Description

General Site Layout from 1941 to 1944

SLAAP was originally part of the St. Louis Ordnance Plant (SLOP). The northern boundary of the facility ended along the north side of the train tracks that served former Building 202 ABC (now Building 3). In the extreme northwest area, the property boundary extended approximately 280 feet north to accommodate a parking area measuring approximately 360 by 280 feet. Except for a guard house (Guard House 209 E), no buildings or manufacturing activities appeared to have occurred at areas north of the railroad train tracks that ran north of Building 3. Residential housing units were located to the north of the SLOP property.

The small arms ammunition (.30-caliber) production unit was comprised of a .30-caliber production building (Building 3), a .30-caliber loading building (then referred to as Building 202D, now Building 5), a .30-caliber primer insert building (then referred to as Building 202E, now Building 6) and a powder canning building (then referred to as Building 202F and later converted to the acetylene production [Building 9], now demolished). Other buildings included the powder storage building (Building 202H, now demolished), oil storage buildings 202 J and 202 K (now demolished but originally located south of Buildings 5 and 6, respectively), Guard Houses 209 and 209 F, and Building 236 D. Guard House 209 was located on the northeast area of the property on Riverview Boulevard. Guard House 209 F was located at the northwest parking area entrance. Building 236 D was a fire equipment house, which is now attached to the SLAAP Compressor Building (Building 4).

*and west
of the
SLOP property*

Underground tunnels connected Buildings 5 and 6 to Building 3, and Building 6 to the former SLOP Building 203, which is now operated by Triad Manufacturing, Inc. These underground tunnels were used to extend high-pressure steam, treated de-ionized water, and other utilities from SLOP's centralized service center to the SLAAP buildings.

General Site Layout after 1944

A total of eleven buildings were utilized in primary production and support roles. Five of these buildings were retrofitted from the .30-caliber manufacturing operations to accommodate 105-millimeter (mm) Howitzer shell production (Buildings 3, 5, 6, and 9). The remaining buildings (Buildings 1, 2, 4, 7, 8, 10 and 11) were constructed in 1944.

Primary manufacturing operations were conducted in Buildings 1 through 3. Building 1 housed billet cutting operations, Building 2 served as the forging center, and Building 3 contained the machining operations. Support functions to manufacturing operations were provided by Buildings 4 through 11. Building 4 contained air compressors, Buildings 5 and 6 provided office and laboratory space, Buildings 7 and 7A cooled noncontact waters used during manufacturing, Buildings 8 (fuel oil tank farm) and 8A (fuel oil tank pump room) delivered fuel to the rotary

furnaces in Building 2, Buildings 9 and 9A through 9D generated acetylene and housed an oxygen converter and receiver all in support of Building 1 operations, Building 10 stored and supplied quench oil to Building 3 heat treating operation, and Buildings 11, 11A, and 11B generated foamite to support fire suppression efforts.

Following conversion to 105-mm Howitzer shell production in 1944, a total of 2,500,000 shells were produced for World War II until the plant was placed on standby in September, 1945. Operations were reactivated on March 25, 1951 by the Chevrolet Motor Division to support the Korean Conflict. From 1951 to 1954, the plant produced 19,094,325 shells. Plant operations were terminated on May 1, 1954 and SLAAP was placed on interim maintenance status. In 1966, the Chevrolet Motor Division reactivated the plant to support the Vietnam War. Production began in November 1966 and continued through December 1969. The production rate reached 600,000 shells per month shortly before operations were terminated. In total, the plant had produced a total of 23,878,646 shells in all three runs (U.S. Army Toxic and Hazardous Materials Agency (USATHMA), 1979).

Wastewater discharges from SLAAP were monitored periodically by the Metropolitan St. Louis Sewer District, and discharges were in compliance with applicable city ordinances. Solid wastes and some liquid wastes were removed from SLAAP for off-site disposal and recycling by a local contractor (USATHMA, 1979).

1.3.2 Site History

SLOP was constructed in 1941 as a 276-acre, small arms ordnance plant for production of .30- and .50-caliber munitions. In 1944, 21.05 acres in the northeast portion of SLOP were converted from small arms munitions production to 105-mm Howitzer shell production and this portion was designated as SLAAP. Additional land was acquired to the north of SLOP to accommodate additional structures to support the new production requirements. Currently, the SLAAP property contains eight unoccupied buildings that were used to house SLAAP's main operating processes.

After World War II, SLAAP was placed on standby status. It was reactivated from November 1951 to December 1954 and again from November 1966 to December 1969 to support 105-mm Howitzer shell production. The plant was maintained and operated by the Chevrolet Shell Division of General Motors from 1951 until 1958, by the U.S. Defense Corporation from 1958 to 1966, and by the Chevrolet Motor Division of General Motors from 1966 until 1972, when Donovan Construction Company was awarded the maintenance and surveillance contract.

In 1984, buildings at SLAAP were renovated to house filing and administrative operations by more than 500 personnel from the U.S. Army Aviation Systems Command (AVSCOM). From 1986 to 1990, SLAAP was under the command of the U.S. Army Armament, Munitions, and Chemical Command (AMCCOM). In 1989, the Department of the Army determined that SLAAP was no longer required to support its munitions mission, and most industrial equipment was removed from the plant. In 1990, plant ownership and control were placed under the U.S. Army Aviation and Troop Command (ATCOM). As of 1993, SLAAP maintenance and surveillance activities were being subcontracted by Donovan Construction Company to Plant Facilities and Engineering, Inc. (PFE). Since 1998, SLAAP has been vacant and under the control of the U.S. Army Aviation and Missile Command (AMCOM).

1.3.3 Summary of Production Processes

Manufacturing Processes from 1941 to 1944

The .30-caliber ammunition round consists of a brass cartridge case, a projectile, powder, and a primer. Manufacture of the cartridge case began with a brass cup. The cup was shaped through a series of cold forming operations, including drawing and other shaping processes. The brass was annealed (heated evenly while maintaining the heat level) at various times during the shaping process to eliminate metal stresses caused by the drawing operations. The brass was also pickled (treated with sulfuric acid) to remove metal oxides. Lastly, the brass was washed and dried to remove the sulfuric acid and associated moisture.

Procedures for fabricating the projectile were similar to those used to shape the cartridge case. Each projectile had a copper jacket shaped through a series of drawing and shaping processes similar to those employed during production of the cartridge case. A lead core (produced elsewhere) was inserted into the copper jacket (ball ammunition) in bullet assembly machines. Armor piercing rounds contained hardened steel cores instead of lead cores. These operations took place on the first and second floor of Building 202 ABC (Building 3).

Smokeless powder and primer (both produced elsewhere) were added to complete the round. A primer cup containing an initiating explosive, such as lead styphnate, was added to the base of the cartridge case after the case was pierced and waterproofed with a varnish (shellac). This operation took place at what is now Building 6. A small quantity of smokeless powder was loaded into the cartridge case and the projectile was assembled and crimped. The loading, assembling, and crimping operations were conducted at what is now Building 5.

Each of these process areas, as well as those support processes conducted in Buildings 202 F, J, and K, are discussed in detail in **Section 1.4**.

Manufacturing Processes after 1944

In 1944, SLAAP facility operations converted from .30-caliber ammunition to 105-mm Howitzer shell production. After producing 2,500,000 shells for World War II, the plant was placed on standby in September 1945. The Chevrolet Motor Division reactivated it on March 25, 1951. From 1951 to 1954, the plant produced 19,094,325 shells. Plant operations were terminated on May 1, 1954, and SLAAP was placed on interim maintenance status. In 1966, the Chevrolet Motor Division reactivated the plant. Production began in November 1966. When operations were terminated in December 1969, the plant had produced a total of 23,878,646 shells in all three runs (USATHAMA, 1979). The production rate reached 600,000 shells per month shortly before operations terminated.

Existing Buildings 202 ABC, 202 D, 202 E, 202 F, and 202H were retrofitted to accommodate 105-mm Howitzer shell production and were designated Buildings 3, 5, 6, and 9 (202 F and 202 H), respectively. In addition, Buildings 1, 2, 4, 7, 7A, 8, 8A, 10, 11, 11A, and 11B were constructed in 1944 to support 105-mm Howitzer shell production.

1.3.4 Previous Investigations

The Comprehensive Environmental Baseline Survey (EBS) [Tetra Tech EM, Inc. (TTEMI), 2000] was completed in general accordance with American Society for Testing and Materials (ASTM) Method D 6008-96, "Standard of Practice for Environmental Baseline Surveys," and ASTM Method E 1527-97, "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process."

A record search and initial site visit was conducted as part of the Comprehensive EBS to identify possible areas of environmental concern at SLAAP. The record search indicated that a Notice-of-Noncompliance (NON) was issued by U.S. Environmental Protection Agency (EPA) Region VII to SLAAP for polychlorinated biphenyl (PCB) contamination in Building 3. Records also indicate that underground storage tank (UST) removals at SLAAP have not been completed in accordance with Missouri Department of Natural Resources (MDNR) requirements. Possible site-wide areas of environmental concern consist of contamination resulting from possible contaminant migration from the PURO Chemical storage facility (formerly part of SLOP) located south of the installation, as well as friable asbestos containing materials (ACM), lead-based paint (LBP) and PCBs contained in original fluorescent light ballasts found at SLAAP.

The following building-specific possible areas of environmental concern were identified through the records reviewed and the initial site visit of the Comprehensive EBS:

- Electrical equipment in Buildings 1, 2, and 4 have oils suspected of containing PCBs.
- Spilled oil was identified in Buildings 1, 2, 3, and 5.
- Concrete-filled hydraulic oil pits, sumps, and floor drains were identified in Building 1.
- Two pits connected to the sewer system were observed at Building 1.
- Debris was present throughout Buildings 1, 2, and 4.
- Building 2 contained subgrade pipes for distributing hydraulic oil with PCB's.
- Soil near the chip chute in the basement of Building 3 is suspected of containing PCBs and pesticides.
- Oil staining was present along the far east foundation wall, on the floor, and on support columns in the vicinity of the quench oil pump room in the basement of Building 3.
- Suspect ACM and suspect PCB-contaminated metal shavings were observed on the basement floor of Building 3.
- A steel separator tank was identified in the south-central portion of the basement of Building 3. The tank was filled with a dried, oxidized material. This material may be of environmental concern. Other pieces of equipment were located in the basement.
- Cracks in the PCB remediated concrete cap were observed on the first floor of Building 3.
- Paint used to seal the steel structures on the first floor of Building 3 was cracking and peeling.
- A solvent room with a drain connected to the sewer system was identified in Building 3 plans.

- A room on the second floor of Building 3 contained an emergency power supply unit. This unit may contain lead-acid or nickel-cadmium batteries.
- A remote quench oil-fill pipe was located near the northeast corner of Building 3.
- The compressor pits in Building 4 are suspected of containing compressor oils with PCB's.
- Ash was observed in a hearth in Building 6.
- The aboveground storage tanks formerly present at Building 8, east of Building 2, are suspected of having leaked and spilled fuel oil.
- USTs have not been officially closed and may present a possible environmental concern.

Phase I Comprehensive EBS results were presented to the MDNR on April 23, 1999 and EPA Region VII. The Phase I results were used to develop a scope of work that included completion and sampling of soil borings, installation and sampling of monitoring wells, wipe sampling, surface soil sampling, concrete core sampling, and an ACM survey. The scope of work for investigating the aforementioned possible areas of environmental concern was coordinated between TTEMI and AMCOM and verbally endorsed by EPA Region VII and MDNR.

Phase II Comprehensive EBS activities were completed in two separate sampling events. The first Phase II sampling event identified areas of contamination and the second Phase II sampling event was performed to further assess and characterize these areas. During a meeting held at the EPA Region VII offices in Kansas City, Kansas, on September 9, 1999, the results from the first Phase II sampling event were reviewed to assess additional areas to investigate, address PCB sampling to resolve the outstanding PBC NON, and additional locations to sample to address the unresolved, outstanding UST cleanup. The first Phase II results were reviewed site-wide and building-by-building. The scope of work for the second phase of the Comprehensive EBS Phase II was developed and work was undertaken based on the outcome of the September 9, 1999 meeting. The data collected during Phases I and II were used to compile the results of the Comprehensive EBS. The draft final Comprehensive EBS report was submitted for review on March 17, 2000 and a meeting to review the report took place on March 31, 2000 at the EPA Region VII offices. During that meeting, the Draft Final Comprehensive EBS report was briefly reviewed. It was agreed that additional information was required, primarily related to:

1. manufacturing activities that took place at SLAAP when it was part of SLOP
2. the Comprehensive EBS analytical data validation report performed by IT Corporation was necessary to assess the validity of the analytical results obtained during the Comprehensive EBS
3. the cleanup criteria used for comparison of analytical results should not be limited to the Cleanup Levels for Missouri (CALM), but should be expanded to incorporate other cleanup criteria, including the EPA Region IX Preliminary Remediation Goals (PRGs) criteria

The revised final Comprehensive EBS report, dated December 28, 2000 incorporated the additional information requested at the May 31, 2000 meeting. The Comprehensive EBS conclusions and recommendations are presented in the Comprehensive EBS report dated December 28, 2000 and are summarized in **Table 1-1**.

EPA Region VII and MDNR provided comments to AMCOM on the revised final Comprehensive EBS report. TTEMI prepared preliminary draft responses to both EPA Region VII and MDNR comments, which were reviewed during a May 17, 2001 meeting held in St. Louis, Missouri. Attendees to this meeting included representatives from AMCOM and its contractor Titan Systems Corporation, SEMCOR Division (SEMCOR), EPA Region VII, MDNR, CENWK, URS, Arrowhead Contractors, Inc. and TTEMI. After this meeting, AMCOM documented the outcome of the review comments and addressed the comments that were not proposed to be deferred to this SSEBS. The minutes of this meeting (SEMCOR, 2001) indicated the following remaining areas of concern for the SSEBS.

Site-wide:

- Areas where Comprehensive EBS mentions areas of environmental concern
- Comprehensive look at sewer system
- UST areas
- Transformer areas
- Metals storage areas
- Sumps

Building 1:

- Sumps
- Soils around break machines – inside
- Subsurface under building – PCB, total petroleum hydrocarbons (TPH), solvents (volatile organic compounds (VOCs))

Building 2:

- Subsurface under building – TPH, Semi-volatile Organic Compounds (SVOCs), PCBs, solvents (sample in grid pattern)
- Sediment in manhole - solvents

Building 3:

- Catch basins – basement of Building 3
- Soils in basement of Building 3
- Under floor of east end of Building 3
- Area with high gasoline hit – near UST next to Building 3
- West end of Building 3 for solvents in water
- Elevator

Building 4:

- Sumps, compressors

Buildings 5 and 6:

- Lab
- Dark room
- Elevator
- South of buildings – small storage areas

Former building 8:

- Pipe chase connecting to Building 2

1.4 INVESTIGATION AREAS BACKGROUND

This section presents an overview of the manufacturing activities conducted at the site, as reported in the Comprehensive EBS report (TTEMI, 2000). Since construction of the facility in 1941, SLAAP has supported two primary production missions. First, several of the SLAAP buildings were utilized in support of .30-caliber munitions production as part of SLOP operations from 1941 through 1944. Second, SLAAP was utilized to produce 105-mm Howitzer shells during intermittent operation phases from 1944 through 1969. Accordingly, an overview of each of the production missions is presented in the following subsections with respect to general site layout, summary of the product processes, and building descriptions.

1.4.1 Building 1

Manufacturing Processes from 1941 to 1944

Building 1 was constructed in 1944 to support the 105-mm Howitzer shell production. No structure existed at this location during SLOP operations.

Manufacturing Processes after 1944

Steel billets were stored in concrete and H-beam racks outside of the eastern and western steel yards next to Building 1. Long, 4-inch square steel billets or bars were fed into the building via conveyor systems to four nicking machines (two on the east and two on the west sides). Each nicking machine consisted of eight oxygen-assisted acetylene torches that would create a nick approximately 1/4" deep and 3/16" wide along the width of each bar. Following nicking, conveyor feeds would move the billets through a direct-contact water cooling process to eight breaking machines (each rated for 530 slugs per hour). The breaking machines were situated inside concrete pits that drained to the south of the building into the sewer system. Billet ends from each end slug were cut to size in cold saw machines. Snag grinding, as necessary, was completed on all breaks that did not meet specifications. Dust collectors with vent hoods were located directly above the nicking machines and directed fumes and fine metallic particulates into dust collectors located inside the building. Ventilators were located next to the saw and grinding machines. Liquid wastes were pumped to the facility sewer system (USATHMA 1979). Following inspection, the finished 8-1/2" slugs were mounted on skids and transported to the forge building (Building 2).

1.4.2 Building 2

Manufacturing Processes from 1941 to 1944

Building 2 was constructed in 1944 to support the 105-mm Howitzer shell production. No structure existed at this location during SLOP operations.

Manufacturing Processes after 1944

Building 2 served as the forge building. Building 2 housed a total of 10 rotary furnaces, 5 were combination natural gas- and oil-fired rotary furnaces and 5 were oil-fired furnaces for slug heating and forging. The inside of the building was almost symmetrically configured, with five rotary furnaces on each side of the building. The cut billets were received from Building 1 and fed into the rotary furnaces. Each furnace was equipped with a rectangular skid conveyor that transferred the hot billet to the sizing and descaling units. The billets were then transported to the piercing presses, where a cup was first formed through hydraulic force. Two piercing presses served each rotary furnace. Following piercing, the billets were then transferred to the hydraulic presses and draw benches, where they were drawn through a series of progressively smaller ring dies. After drawing, the formed billet was inspected and cut to length at the hot cut-off machine. One cut-off machine was present at each rotary furnace unit. The shells were then transferred by the air-cooling conveyor to the water quench tanks. A descaling tank was located in the middle western half of the building. After cooling, the shells were mechanically conveyed to the second floor of Building 3 by an elevated covered bridge that connects these two buildings.

Hydraulic accumulators (one on each side of Building 2) were utilized to supply hydraulic oil to the forging process. Each hydraulic accumulator consisted of 10 hydraulic pumps connected to an above ground, 5,000 gallon oil tank in the middle section of the building. Natural gas was supplied by an underground utility supply system. No. 6 fuel oil was supplied by Buildings 8 and 8A through underground fuel lines. Each furnace had a dedicated oil fuel line that came through the floor near an I-beam next to the furnace.

Electrical transformers and equipment were housed in two enclosed elevated mezzanines located in the bays between the walls and the first I-beam row inside the building.

1.4.3 Building 3***Manufacturing Processes from 1941 to 1944*****First Floor**

For ease of reference, text discussing the layout of Building 3 will cite locations of alphanumeric building I-beams and columns as originally designated in record drawings. This grid system designates the furthest north I-beam row as Row A. The I-beam number 1 is designated as the furthest west I-beam Row. Thus, I-beam B2 is the second I-beam from the north end of the building, and the second I-beam from the building's west wall.

Materials were received at the loading dock between I-beam Rows A and B and Rows 1 through Row 11, where a 3-ton hoist unloaded case cups, ball jackets, armor-piercing jacket coil stock and other raw materials. Raw materials were stored either in the southwest corner of the building between I-beam Rows H and L, and 2 and 5, or at the coil stock storage area between I-beam Rows 4 and 10, and C and G.

Coil reels were fed to either seven jacket blank and cup machines or to four base blank and cup machines located in the aisles between I-beam Rows 9 and 11, and C and H. Nine first-draw machines and 11 second-draw machines were installed in the aisles between I-beam Rows 11 and 13, and B and H. Twenty-eight bump machines were aligned in pairs between I-beam Rows

13 and 14, and B to H. A soap mixing room with two mixing systems was located in a room at I-beam Row 13 between I-beams A and B. The soap was used in pickling operations on the second floor. Fourteen third-draw machines and 10 first-trim machines were located along the aisle between I-beam Rows 14 and 15 from Rows B through H. Nineteen first-draw machines were located east of I-beam Row 15 between Rows B and H. Eighteen fourth-draw machines were located next to I-beam Row 16, nine on the east and nine on the west side of I-beam Row 16 between Rows B and H. Twenty-nine second-trim machines, nineteen on the west and ten on the east were located along I-beam Row 17 between I-beams B and H. Thirty pocketing machines were located along I-beam Row 18 between Rows B and H. The aisle between Rows 19 and 20 was occupied by 30 heading machines arranged in a similar fashion as the pocketing machines between I-beam Rows B and H.

A second loading dock was located between I-beam Rows 15 and 17 west of the electrical transformer vault between I-beam Rows A and B. Scrap salvage, including a baler system, was located in a room confined between I-beam Rows A and B and Rows 17 and 21.

Open corridors or aisles were maintained between I-beam Rows B and C and between I-beam Rows G and H throughout the first floor of Building 202 ABC. A maintenance area and a tool and machine shop were located west of the storage area between I-beam Rows 5 and 9 from I-beam Rows H to L.

Six Salem annealing furnaces, each equipped with independent turbo compressors, product elevators and quench tanks, were located between I-beam Rows 10 to 17 on the south side of the building. The product to be annealed was fed from the second floor through rectangular hoppers located on the north side of the furnace that connected directly to the annealing furnace drive system. The product was then quenched and transferred to the second floor by elevators located south of the furnaces.

South of I-beam Row K, between I-beam Rows 17 and 20, were 27 jacket trim machines, 23 for ball jackets and four for armor-piercing jackets. Twelve jacket first-draw machines, nine dedicated for ball jackets and three for armor-piercing jackets were located south of I-beam Row H between I-beam Rows 17 and 20. Twelve jacket second-draw machines were located north and south of I-beam Row J between Rows 17 and 20. Eighteen jacket third-draw and three jacket fourth-draw machines were located in the aisle between I-beam Rows J and K and Rows 17 through 20.

An air compressor room was located between I-beam Row 24 and 25 and A and B. Loading docks were located in the open bay between I-beam Rows A and B from Rows 26 to 32, and from I-beam Row 34 to the east end of the building.

Cup manufacture began in the bay between Rows 21 and 23 and C through G. Up to 47 head-turning machines (16 west of I-beam Row 22 and 31 in the aisle between I-beam Rows 22 and 23) were mounted on benches. Spiral chutes and elevators on the north and south ends transferred product between the first and second floors. Three vibrating feeders, fifteen body annealing furnaces, and an elevator were located just east of I-beam Row 23 from I-beam Rows C through G.

Twenty-nine taper and plug machines were located east and west of I-beam Row 24. These machines received product from two spiral chutes located next to I-beam C24 via feeders and

belt conveyors. Product from the taper and plug machines was transferred to a belt conveyor located at floor level that discharged to the product elevator located near I-beam G24.

Twenty-five finishing and trimming machines were located along I-beam Row 25. A spiral chute fed product from the second floor to a vibrating feeder. The vibrating feeder discharged to a feed belt conveyor that supplied the finishing and trimming machines. The product was then transferred to an elevator located on the north end just northwest of I-beam C25.

Mouth and neck annealing took place between I-beam Rows 25 to 27 and C through G. The aisle between I-beam Rows 25 and 26 and C through G housed one annealing laboratory. Twenty-four mouth and neck annealing machines were located in the bay between Rows 26 and 27. Casings were transferred from the second floor by a spiral chute and vibrating and rotary feeders to the mouth and neck annealing machines from the south end. The annealing machines discharged the casings to an elevator, rotary feeder and feed belt to the 30 final inspection machines located along I-beam Row 27. The casings were then transferred to the piercing machines by an elevator located at the south end of the final inspection machines southeast of I-beam G27.

Fifty bullet assembly machines, approximately thirty-six for ball bullets and fourteen for armor-piercing bullets, were located in the area between I-beam Rows 22 and 28 south of Row H to the south wall, leaving aisle space near the south building wall. The finished cartridge storage area was located between I-beam Rows B through G through the east end of the buildings. An inspection area was located east of the bullet assembly area between I-beam Rows 28 to 33 south of Row H. A cafeteria with a kitchen and a men's locker room were located at the southeast corner.

Second Floor

The west end housed a canteen area with a kitchen, storage room, fan room, and women's and men's locker rooms. The canteen was located between I-beam Rows B and G, and 1 and 8. The locker rooms were located south of I-beam Row G from Rows 1 through 9.

The same manufacturing operations described for the first floor were supported or performed on the second floor. Hoppers transferred cartridge case product from the second floor to the first floor and elevators conveyed product from the first floor to the second floor. The hoppers and elevator were located at the blank and cup, first-draw, second-draw, bump, third-draw, first-trim, fourth-draw, second-trim, and pocketing and heading machine lines from I-beam Rows 10 to 20, between I-beam Rows C and G. Similarly, the bullet jacket draw area included floor hoppers that conveyed bullet jackets to the first-draw, second-draw, third-draw and fourth-draw and jacket-trim areas. This area was located south of I-beam Row H between I-beam Rows 17 and 20.

Six 2,000-pound Salem picklers were located south of I-beam Row H between I-beam Rows 10 and 17. Each pickler was equipped with an independent pickling tank with vent system, acid rinse, cold-water rinse, hot-soap bath, hot-water rinse and dryer. Each pickler was placed within a drainage area with independent floor drains connected to the building sewer system. Six floor hoppers fed the Salem furnaces on the first floor. The hoppers were located north of I-beam Row J between I-beam Rows 10 and 17. Two product washers served by a common floor drain were located south of I-beams H10 and H11. Two more washers, each with a dedicated floor

drain, were located along the north building wall south of I-beams B14 and B17. Two wash-and-dry machines were located in the cartridge draw area, each with independent floor drains. One machine was located between I-beams C13 and C14, and the other was located south of I-beams B18 and B19. Aisle space was maintained in the second floor of Building 202 ABC between I-beam Rows 20 and 21, at the north side of I-beam Row H, and along the south building wall.

Seven product washing machines and two drying machines were located between I-beam Rows 20 and 22. Two soap mixing machines and five wash barrels were also located in this area between I-beam Rows C and E. Four head-gauge shaker tables were located between the head turning and body annealing lines. A roller conveyor on the floor was used to transfer baskets used to feed the Lindberg furnaces located south of I-beams C25 and C26. Pickling and rinsing units, six wash barrels and two dryers were located in the bay between I-beam Rows 25 and 26 from Row D to just south of Row G.

Two fuel gas mixing systems were located in a room south of the north building wall between I-beam Rows 24 and 25. A washer was south of I-beams G24 and G25.

The hoppers that fed the 50 bullet assembly machines were located between I-beam 22 and 28, south of I-beam Row H though the south wall, leaving aisle space near the south building wall.

After final inspection, an overhead conveyor belt transferred the cartridge cases to the Primer Insert Building (Building 6).

A 5-day cartridge storage area was located between I-beam Rows 29 and 34, and B and F. Four cartridge clip assembly units were housed between I-beam Rows 34 and 35, and between the north building wall and I-beam Row E. Forty-eight gauge and weight stations were located between I-beam Rows 28 to 37, and F and H. Five labeling and packing machines with a gravity roller conveyor and spiral chute to the first floor storage area were located between I-beam Rows 36 and 39 in the northeast corner of the building. Five Inman partition machines were located next to the east building wall between I-beam Rows F and H.

A loaded scrap salvage area was located between I-beam Rows 29 and 31 north of the south building wall. Primed cartridges inspection benches were located north of the south building wall between I-beam Rows 32 and 34. The inspection layout room was located along the south building wall between I-beam Rows 34 and 36. The southeast corner of the second floor was utilized as a women's restroom and locker room.

One overhead bridge connects Building 3 to Building 6 via the bridge between I-beam Rows 27 and 28. This bridge conveyed cartridge cases from the final inspection line for primer insertion.

Manufacturing Processes after 1944

The first and second floors in Building 3 were used for machining operations. The building housed various lathe operations; hydraulic presses; conveyors; air-driven machinery for steel cutting, shaping, and finishing; and metal preservative operations. Other equipment included welding machines; machine, electrical, and carpenter shops; and a small automotive shop. A self-contained liquid storage area was located on the first floor that stored various oils, solvents, and chemicals. As of January 1969, the following oils, greases, and process fluids were used:

- MR 186 - hot forging compound

SECTION ONE

Introduction

- Molyshield grease - Alubo
- MX-2 Hi-Temperature grease
- Coolex # 25 coolant
- GM-3 Cold hosing compound
- Spindle oil
- Various lubricating oils (Regal, Mobil, and Shell)
- Hydraulic oil General Motors Specification 16A
- Ecnogrind
- Hot Forging Compound

Process fluids included (USATHMA, 1979):

- Thinner (toluol used at a rate of 45,000 liters per month)
- Enamel 1T-E-516 (used at a rate of 159,000 liters per month)
- Primer MIL-P-223332A (used at a rate of 36,000 liters per month)
- Corrosion-preventive phosphoric acid (used at a rate of 2,500 liters per month)

The following table summarizes information pertaining to components of the above listed compounds found through searches of chemical handbooks, manufacturer's MSDS, and general web searches (including MSN, Yahoo, Lycos, etc.).

Oil/Grease/Compound	Metals ¹	VOCs	SVOCs	PCBs	Notes
Hot Forging Compounds - MR 186 and others	Possible	Possible	Yes	Possible	
Greases - Molyshield Grease - Hi-Temperature	Possible	Possible	Yes	Possible	
Coolant	Doubtful	Possible	Yes	Possible	
Cold Hosing Compound	Possible	Possible	Yes	Possible	
Various Oils including - Spindle Oil - Lubricating Oils - Hydraulic Oils	Possible	Possible	Yes	Possible	
Ecnogrind	Possible	Doubtful	Likely	Possible	
Toluol Thinner (Toluene)	Doubtful	Yes	Doubtful	No	
Painting Products - Enamel 1T-E-516 - Primer MIL-P-223332A	Likely	Yes	Doubtful	No	
Corrosion-Preventive Phosphoric Acid	No	No	No	No	H ₃ PO ₄

¹ RCRA Metals – Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Nickel, and Selenium

The following discussion of Building 3 processes is organized to follow the flow of production.

The second floor of Building 3 housed fourteen furnaces were located between I-beam rows 28A through 43. Rough machining equipment was also located on the second floor of Building 3. Forged shells were put through the bore nose or Sundstrand lathe (between I-beam Rows 11A and 14) followed by shot blasting (between I-beam Rows 14 and 17). The shells would progress through the machining process from west to east, ending at the annealing furnaces at the east end of the building. Center lathes were located between I-beam rows 18 and 20, and the rough-turning gross lathe was located between I-beam Rows 21 through 25.

The first floor of Building 3 contained the following major equipment. A paint stripping room was located on the east end of the building north of the garage. Quench oil tanks used to quench the shells after heat treatment in the annealing furnaces were located west of the paint stripping room. Shell washing was conducted before painting, which was conducted in paint booths west of the quench oil tanks. Shell washing included the addition of phosphoric acid, rinsing, chromic acid bath prior to painting. The paint mixing room was located between I-beam Rows 28A and 32. The area outside the paint mixing room stored empty barrels. Four paint mixing stations were used inside the paint mixing room. Various lathing, welding, and grinding areas are located between I-beam Rows 6 through 24. Grinders, shapers, mills, and lathes are also located between I-beam Rows 6 through 9. A hydraulic oil-reclaiming unit was located on the north side of the first floor of Building 3, between I-beam Rows 10 and 11A, and 11 B. A soluble oil mixing room was located next to I-beam Row 13 between Columns A and B.

The basement contained four transformer vaults, a cable vault, elevator pits, two quench oil transfer pump systems, two former quench oil tanks, a former sludge pit, and a former gasoline UST. The quench oil pumps supplied make-up oil from each of the quench oil tanks. A return line located between I-beams Columns E and F collected quench oil from the first floor and conveyed it to the quench oil sludge pit to remove particulates and sediment. This tank overflowed into the quench oil tank next to the quench oil sludge pit. The three quench oil tanks were hydraulically connected. The overflow from the oil sludge pit was directed by gravity to the oil tank south of the pit. The concrete floor area was located between I-beam Rows 9 and 23.

The roof of Building 3 contained cooling towers, paint room exhaust fans, furnace exhaust fans, and dust collectors for machining operations performed on the second floor. The cooling towers served the furnaces and cooled quench oil, hydraulic oil, and other fluids through cooling water from Building 7.

1.4.4 Building 4

Manufacturing Processes from 1941 to 1944

Building 4 was constructed in 1944 to support the 105-mm Howitzer shell production. No structure existed at this location during SLOP operations.

Manufacturing Processes after 1944

Building 4 was the air compressor building. Five compressors were connected to ten air intake lines, two for each compressor. The intake lines were located outside along the south wall of Building 4. Individual air filter systems were connected to each air intake outside the building. The intakes entered the building beneath the floor into the compressors. Each compressor was equipped with an intercooler and aftercooler (located in a pit below the floor level). Five air receivers were aligned outside the north wall of Building 4. A cable room and vault are located in the western portion of the basement of Building 4.

An electrical room that housed the motor control center for the air compressors and other equipment was located west of the compressor area.

1.4.5 Building 5***Manufacturing Processes from 1941 to 1944***

Five .30-caliber powder loading, assembly and crimping stations (four on the south side and one on the northeast side) were located in Building 5. This building did not have automatic loading machines. Four case shakers, one at each of the south stations, were used to supply cases for powder loading. Roller conveyors transferred cases from the case shakers to the powder-loading compartment.

Four jacket shakers, one at each of the south stations, were used to supply ball or armor-piercing jackets for bullet assembly. A second conveyor system transferred loaded cases to just outside the independent assembly compartment, where the jacketed bullet was attached to the loaded cartridge case. The assembled bullet was crimped at one of the four independent crimping compartments. The cartridges were then identified in one of the four identifying units, inspected, and conveyed to the second floor of Building 3 for further processing.

It appears as if a station at the northeast corner of the building was a non-operational spare station. This station contained only powder loading, assembly, and crimping compartments and machines. No ancillary conveyor systems, tables, inspection benches, case and jacket shakers or identifying units were present. Other equipment on the second floor included the elevator and the conveyor system that brought the product from the first floor of Building 5 to the second floor of Building 3 to the gauge and weight area. No other equipment was installed on the second floor of Building 5.

Building 202 J

This building was used for oil storage to support the operations at Building 5. The building was 6 feet wide, 13 feet long, and 8.5 feet high, and was constructed on a 12-inch thick concrete slab without drains. A maximum of four oil drums could be stored and used at this location.

Manufacturing Processes after 1944

Building 5 was primarily used for office space. It consisted of a two-story building with an elevator and restrooms. No 105-mm Howitzer shell production took place at this building.

1.4.6 Building 6***Manufacturing Processes from 1941 to 1944***

Ten primer invert machines and 36 primer insert machines were located on the first floor of Building 6. A laboratory equipped with service and primer drop test benches was located in the southeast corner of the building. Four of the primer invert machines were located in the middle section of the building, two along the south building wall and two along the north wall. The other six primer invert machines were located in the extreme southwest corner of the building, south of the locker rooms.

Thirty-six primer insert machines were located along the middle section of the building. Cartridge cases were fed from the overhead conveyor belt, into a spiral chute located on the second floor, and into a vibrating feeder located on the east side of the building. A feed belt that ran along the middle section of the building received the cartridge cases and transported them to the primer insert machines, which were arranged in pairs, one on each side of the feed belt. Rectangular chutes transferred the cases to the primer insert machines. The primed cases were discharged to a belt conveyor that ran at floor level, and in turn, supplied an elevator located east of the spiral chute. Other than the conveyor system on the second floor, no equipment was installed on the second floor of Building 6.

Building 202 K

This building was used for oil storage to support the operations at Building 6. The building was 6 feet wide, 13 feet long, and 8.5 feet high, and was constructed on a 12-inch-thick concrete slab without drains. A maximum of four oil drums could be stored and used at this location.

Manufacturing Processes after 1944

Building 6 was also used as office space and housed an inspection department and laboratory. The laboratory consisted of a chemical department, physical department, office, dark room, and chemical storage area. A deep-etch fume hood was located along the south wall. Lockers and restrooms were located in the west end of the building.

1.4.7 Building 7***Manufacturing Processes from 1941 to 1944***

Building 7 was constructed in 1944 to support the 105-mm Howitzer shell production. No structure existed at this location during SLOP operations.

Manufacturing Processes after 1944

Five centrifugal pumps were used in Building 7 to support water and other cooling fluid requirements.

1.4.8 Building 8

Manufacturing Processes from 1941 to 1944

Building 8 was constructed in 1944 to support the 105-mm Howitzer shell production. No structure existed at this location during SLOP operations.

Manufacturing Processes after 1944

Nine No. 6 fuel oil tanks were located first north of Building 2 and then relocated in 1958 to the east side of Building 2 to accommodate construction of Interstate Highway 70 along the northern property boundary.

1.4.9 Building 10

Manufacturing Processes from 1941 to 1944

Building 10 was constructed in 1944 to support the 105-mm Howitzer shell production. No structure existed at this location during SLOP operations.

Manufacturing Processes after 1944

Building 10 was a series of tanks installed to allow for an increase in production of 105-mm Howitzer shells. The three quench oil tanks and the quench oil sludge pit were located outdoors in front of the east end of Building 3 and supplied cooling oil (No. 6 fuel oil) to 14 quench oil tanks located on the first floor of the east section of Building 3.

1.4.10 Northeast Parking Area

This area was originally an open, grassy area north of Building 1 and east of Building 2. The area was paved between 1965 and 1968, probably prior to, or concurrent with, the plant resuming production in November 1966.

1.4.11 Railroads

The railroads on the Site served as access to bring raw materials into the plant and haul both .30-caliber ammunition, from 1941 to 1944, and 105-mm Howitzer shells, after 1944, from the plant. The spur lines serving SLAAP appear to be relatively unchanged from 1941 to present.

1.4.12 Roadways

Roadways on the Site were constructed at various times throughout the operation of the facility. Most of the original roadways consist of approximately 12 inches of high chert-aggregate content Portland cement with 3 to 6 inches of asphalt overlay. Newer roadways and parking areas, constructed after 1944, consist solely of the asphalt portion. These areas include portions of the roadway and parking area east of Buildings 3 and 5, the parking areas east and west of Building 1, and the Northeast Parking Area.

The current parking area and roadway east of Building 5 covers the locations of former Buildings 9, 9A, 9B, 9C, and 9D. Background on the processes conducted at these facilities is provided below.

Buildings 9 and 9A, Powder Canning and Storage Buildings (1941 to 1944)

Powder canning and storage took place at Buildings 9 and 9A, respectively. Powder containers (15-inch-diameter cylinders approximately 2.5 feet tall and weighing 185 pounds) were emptied into rectangular brass hoppers equipped with copper screens that were located within an enclosed wall system designed to contain accidental explosions. The hoppers delivered smokeless powder to the canning table via 3-inch copper tubing through a concrete wall. The copper tubing was fitted with two quick-action valves, one before and one after the concrete wall.

Buildings 9 and 9A through 9D, Acetylene Generation Area (after 1944)

The acetylene generation area consisted of the Acetylene Generator Building (Building 9), the Carbide Storage Building (Building 9A), the Sludge Pits (Building 9B), the Oxygen Receiver (Building 9C), and the Driox Oxygen Converter (Building 9D). The Oxygen Receiver (Building 9C) was an aboveground storage tank (AST) owned by the oxygen gas supplier.

1.4.13 Sewers

The combined sewer system for the Site was installed during construction of the facility in 1941 and 1944. The system consists mostly of vitrified clay pipe ranging in size from 4-inch floor drains to 18-inch mains. Some concrete sections of pipe were installed during subsequent modifications to the Site, usually for additional storm runoff control as more of the Site was paved to provide additional parking.

1.4.14 Groundwater

There are no known historical uses of groundwater in the vicinity of SLAAP. The original design drawings show plumbing for the city water supply in all buildings. The City of St. Louis also has an ordinance prohibiting use of wells within the area supplied with city water.

1.4.15 Regional Background

Areas for regional background soil sampling were researched for areas with similar impact from railroads and roadways, but with no prior industrial activity.

Fieldwork for the SSEBS began on August 12, 2002 and was completed on October 4, 2002. Sampling activities were completed between August 19, 2002 and September 20, 2002. All fieldwork was conducted in accordance with the FSP, except as noted in the following investigation area-specific sections.

As part of the SSEBS sampling activities, two methods were utilized for collecting six hundred and sixty six soil samples. The majority of the soil borings were advanced by Below Ground Surface, Inc. using a pick-up mounted Geoprobe® rig Model 5410 equipped with either a RS60 3¼" interior diameter sampler for the first four feet of boring or a Macrocore 2" interior diameter sampler for deeper borings. Soil samples were collected at the appropriate intervals from the disposable Teflon liner for each boring. Soil samples in building basements or other locations inaccessible to the Geoprobe® rig were collected with stainless steel hand augers. Soil samples were collected in accordance with the FSP from depth intervals of 0 to 0.5 feet, 4 to 5 feet, and 9 to 10 feet below ground surface (bgs) unless otherwise noted in the investigation area-specific sections below. Ten surface samples were collected using a stainless steel hand auger from two area municipal parks to define regional background concentrations of metals and polynuclear aromatic hydrocarbons (PAHs).

Other portions of the investigation at the site included a sewer survey consisting of the collection of wastewater samples from ten manholes and sediment samples from five manholes, and a videotaping of accessible sewer lines to identify any breaches. Four new monitoring wells were installed, developed and then sampled along with the nine existing on-site monitoring wells during this investigation. Water was observed leaking from an on-site fire hydrant in close proximity to several of the new monitoring well installation locations where water was also noted in the gravel layer beneath the roadways. Water from the hydrant as well as the nearby monitoring wells were also analyzed for certain indicator parameters to evaluate whether the groundwater observed in these wells was actually city water from a hydrant or water line leak. Miscellaneous samples collected throughout the site included: twenty refractory brick samples, eighteen concrete samples, six mastic samples, two product samples, three sediment samples, and eleven surface wipe samples. Collection of the concrete, mastic and product samples required the following modifications and additions to the FSP.

The FSP stated that the concrete samples would be collected by removing a core of concrete in the field and submitting it to the laboratory for pulverizing and analysis. However, situations and conditions prevented this, so all concrete samples were collected in accordance with the following procedure. The area for the sample was marked and cleaned of all loose debris and dust, the hammer drill was used to create between five and sixteen holes of the appropriate depth, the dust from these holes was collected and placed in labeled sample containers and submitted to the laboratory for analysis.

Mastic and product sampling procedures were not defined at the time of publication of the FSP. The following protocols were implemented in the field for the collection of these samples. Mastic samples were collected by first prying loose any floor tiles that may have been present, scraping the mastic from the sub-floor material with a chisel or similar tool, then collecting the pieces of mastic and placing in a sample jar for submittal to the laboratory for analysis. Product samples were collected by accessing the container or conduit containing the product and using a stainless steel scoop or similar tool to obtain some liquid product from the container and place in a samples jar for submittal to the laboratory for analysis. Samples were identified and collection jars labeled in the field as products were observed in various containers on the site.

Arrowhead Contracting, Inc. (Arrowhead) provided excavation and concrete coring and cutting equipment and personnel to allow access to soils underneath buildings and roadways.

Investigation derived waste (IDW) management services (cutting fluid and decontamination water collection, soil cuttings drum storage, excavation material handling, and disposal analysis and permitting) were also provided by Arrowhead.

During the SSEBS investigation, a temporary field office was set up in Building 5. Power was provided by a trailer-mounted 125 kW generator. Water for drilling and decontamination was obtained, with the permission and equipment from the City of St. Louis - Water Division, from a hydrant located near the southeast corner of Building 5.

Field equipment, drilling and all sampling activities were in accordance with the FSP, which describes procedures for soil boring and sampling (Section 5.2), monitoring well installation, development and sampling (Section 5.3), wastewater and sediment sampling (Section 5.4), concrete sampling (Section 5.5), test pit and trench excavation and sampling (Section 5.6), surface wipe sampling (Section 5.7), video surveying for the sewers (Section 5.8), and refractory brick sampling (Section 5.9). Decontamination at the site was done in accordance with the procedures detailed in the FSP (Section 5.11), including heptane rinse for reusable sampling equipment. Sample labeling, handling and documentation was performed in accordance with Section 6 of the FSP.

All sample locations were surveyed by a licensed surveyor (St. Charles Engineering and Surveying), except for those that were not accessible inside of buildings or due to Building 3 demolition activities. For locations inside of buildings, one location close to a doorway was surveyed and the remaining locations were measured from that location with a surveyor's tape. All laboratory analyses, except asbestos and dioxin, were performed by TriMatrix Laboratories, Inc. in Grand Rapids, Michigan. Asbestos was analyzed by EMSL (a NVLAP certified laboratory) in Ann Arbor, Michigan. Triangle Laboratories in Durham, North Carolina performed dioxin analysis. Quality Assurance (QA) samples were analyzed by the USACE Waterways Experiment Station Environmental Laboratory, Omaha Branch (CEWES) in Omaha, Nebraska. EPA representatives also collected split samples of various media for analysis. All analyses were performed in accordance with the Sampling and Analysis Plan (SAP) (URS, 2002), except as noted in the Quality Control Summary Report (QCSR) (URS 2003). **Table 2-1** presents the analysis types and analytical methods used for determining the concentration of each group of compounds as well as a legend of analytical acronyms.

The following SSEBS investigation area-specific discussions on field activities include the media, intervals, quantities, and locations of samples collected; general field procedures used; and any deviations from the original sampling plan presented in the FSP. A summary of the analyses for all samples is presented in **Table 2-2**. All of the on-site sample locations are shown on **Figure 2-1**.

2.1 BUILDING 1

2.1.1 Concrete

One concrete sample location (01CS-01) was planned in Building 1, in an oil spot on the floor, near the southwest corner. This oil was wipe sampled during the Comprehensive EBS

investigation and found to contain PCBs. Concrete samples were collected at this location from 0-1 inch and from 2-3 inches using a hammer drill and analyzed for PCBs.

2.1.2 Soils

Seventeen Geoprobe[®] soil borings (01SB-01 through 01SB-17) were planned to assess areas potentially impacted by historic industrial activities in and around Building 1. Eleven of these borings (01SB-01 through 01SB-11) were planned within the footprint of the building and the other six were located in the parking areas (former billet yards) to the east (01SB-12 through 01SB-15) and west (01SB-16 and 01SB-17) of the building. Conditions at several boring locations within Building 1 required the following modifications from the FSP. Boring 01SB-09 was intended to investigate a second sump along the south wall of the building, however a second sump was not identified during sample layout activities so this boring was eliminated. Several boring locations (01SB-08, 01SB-10 and 01SB-11) were offset adjacent to sumps instead of in them because these locations were inaccessible for the concrete coring machine and the Geoprobe[®] could not penetrate the concrete bottom of the sump. Samples were still collected at the designated depths relative to the bottom of the sumps. Boring 01SB-10 were advanced using a stainless steel hand auger due to overhanging structures blocking access for the Geoprobe[®]. However, the hand auger met refusal at 5.5 feet, after collection of samples 01SB-10(0-0.5)-0802 and 01SB-10(04-05)-0802, therefore, the boring was offset and completed using the Geoprobe[®]. These borings were later identified as 01SB-10Shallow and 01SB-10Deep. During sample layout activities it was noticed that borings 01SB-04 and 01SB-07 were within five feet of each other. As a result, 01SB-07 was located and sampled as planned (in an oil-stained area), and 01SB-04 was relocated within an open sump found in the southwest corner of the building. The operational purpose of this sump was not known. Samples from borings 01SB-01 and 01SB-02 were analyzed for PCBs and TPH. Samples from borings 01SB-03, 01SB-05, 01SB-06, and 01SB-12 through 01SB-17 were analyzed for metals. Samples from boring 01SB-04 were analyzed for metals, PAHs, PCBs, and VOCs. Samples from borings 01SB-07 were analyzed for PCBs. Samples from borings 01SB-08, 01SB-10, and 01SB-11 were analyzed for metals, PCBs and TPH.

Ten risk assessment borings were associated with Building 1. Four of the sample locations (RA-01SB-01 through RA-01SB-04) were situated in the parking area (former billet yard) west of Building 1, two (RA-01SB-05 and RA-01SB-06) were within the footprint of the building, and four (RA-01SB-07 through RA-01SB-10) were located in the parking area (former billet yard) east of Building 1. All of the risk assessment borings were sampled using the Geoprobe[®] rig and analyzed for metals, PAHs, PCBs, and VOCs.

2.2 BUILDING 2

2.2.1 Asbestos Containing Materials

Twenty refractory brick samples were collected from the debris piles in the forge furnace foundations in Building 2. Two types of refractory bricks were identified and one sample of each type was collected from each furnace foundation for asbestos fiber analysis.

2.2.2 Concrete

The FSP did not include concrete sampling in Building 2, however, significant oil staining was observed on the floor and therefore ten concrete sampling locations (02CS-01 through 02CS-10) were identified. Samples were collected at each of these locations from 0-1 inch using a hammer drill and analyzed for PCBs.

2.2.3 Product

Product samples were not addressed in the FSP, however, after arriving on site for sample layout activities, an oil-filled pipe was identified in the southeast corner of Building 2. A sample (02PD-01) of the oil was collected and submitted for TPH-DRO, TPH-GRO and PCB analysis.

Four small tanks with conduits containing a black substance were also observed in the western mezzanine. One of these tanks was opened and a product sample (02PD-02) was collected and analyzed for PCBs.

2.2.4 Soils

Nine soil borings (02SB-01 through 02SB-09) were planned within the footprint of Building 2 in areas that may have been impacted by historic industrial activities. Borings 02SB-01 and 02SB-02 were located in oil-stained areas in the northeast corner of the building. Two other borings were located in oil-stained areas of the pump stations in Building 2 (02SB-03 in the west and 02SB-04 in the east pump station). Borings 02SB-05 through 02SB-09 were located at the bottom of the central pipe trench connecting the pump stations. All of these borings were advanced using the Geoprobe[®] rig and analyzed for PCBs and dioxins (if PCBs were detected). Samples from borings 02SB-01 through 02SB-04 were also analyzed for TPH.

Eight test pit soil borings were planned in two test pits located in "production loops" along either side of Building 2, 02TS-01 through 02TS-04 in the western test pit and 02TS-05 through 02TS-08 in the eastern test pit. Two samples (0 to 0.5 feet and 4 to 5 feet bgs) were collected from each boring using a stainless steel hand auger and analyzed for metals, PAHs, PCBs, dioxins (if PCBs were detected), and VOCs. Two modifications were made to the FSP for the Test Pit soil samples in Building 2. First, boring 02TS-01 was originally located beneath the western test pit floor, however the concrete floor of the trench at this location was more than six feet thick. As a result, the boring was re-located adjacent to the trench and three samples were collected using the Geoprobe[®] rig. These samples were noted as 8 to 9 feet, 12 to 13 feet and 17 to 18 feet bgs which was measured from the floor of the building to coincide with the prescribed depths from the bottom of the 8 foot deep pit. Second, a discretionary sample was collected in boring 02TS-05 from 2 to 3 feet bgs and analyzed as the other test pit soil samples. In addition to the eight test pit soil borings identified in the FSP, a ninth test pit boring location (02TS-09) was located in a third test pit that was excavated south of the eastern pit in Building 2. Two additional soil samples were collected and analyzed for metals, PAHs, PCBs, dioxins (if PCBs were detected), and VOCs. Dioxin analysis of test pit soil samples was not specified in the FSP, but was added for consistency within Building 2 soil samples.

Twelve risk assessment borings (RA-02SB-01 through RA-02SB-12) were advanced within the footprint of Building 2. All borings were sampled using a Geoprobe[®] rig with the exception of RA-02SB-09 that was collected from below the bottom of a trench using a stainless steel hand

auger. Two other risk assessment borings (RA-02SB-03 and RA-02SB-12) required modification to the FSP when they were offset from the trenches they were originally located within and samples were collected using the Geoprobe[®] rig. Three samples were collected from each boring and analyzed for metals, PAHs, PCBs, dioxins (if PCBs were detected), and VOCs.

Arrowhead collected composite soil samples from the material removed from the test pit excavations for waste characterization. Backfilling of the test pit excavations was postponed until completion of the Contingency Sampling Program (see **Section 5.1.2**).

2.2.5 Surface Wipes

Surface wipe samples were not planned in the FSP for Building 2. However, during excavation activities in one of the trenches (near the center of the building), some conduit was encountered that was filled with a black, viscous substance. A wipe sample (02SW-01) was collected from the wiring that was covered with this black substance and analyzed for PCBs.

2.3 BUILDING 3

Building 3 was investigated by Arrowhead under Contract No. DACW41-00-D0019, Task Order No. 0002 with CENWK. Contaminated soils were sampled and subsequently removed along with the building structure during 2002. These actions have addressed and resolved the issues cited in the NON previously identified in **Section 1.3.4**. Results from the April 2002 sampling event in Building 3 and removal of the impacted soils will be addressed in the SSEBS and HHBRA.

2.4 BUILDING 4

2.4.1 Concrete

One concrete sample location (04CS-01) was planned in Building 4 in an oil spot on the concrete floor identified in the Comprehensive EBS as containing PCBs. Concrete samples were collected from this location from 0-1 inch and from 2-3 inches using a hammer drill.

During sample layout activities, an oily residue was observed in the bottom of the utility trenches that were located to the north of the air compressor pits. Two additional concrete samples (04CS-02 and 04CS-03) were located in these trenches and analyzed for PCBs. These concrete samples were collected from 0-1 inch only, using a hammer drill.

2.4.2 Soils

There were three soil borings (04SB-01 through 04SB-03) advanced to assess potentially impacted soils due to industrial activities in Building 4. Boring 04SB-01 was located underneath a transformer in an area of PCB-contaminated oil staining. Samples were collected from three depths (0 to 0.5 feet, 4 to 5 feet, and 6 to 7 feet bgs) using a stainless steel hand auger prior to encountering refusal and analyzed for PCBs. Borings 04SB-02 and 04SB-03 were collected from beneath two randomly selected, concrete equipment pits inside Building 4. Samples were collected from three depths (0 to 0.5 feet, 4 to 5 feet and 9 to 10 feet bgs) using a stainless steel hand auger and analyzed for PCBs and TPH. Two additional borings (RA-04SB-01 and RA-

04SB-06) will also be used to assess potentially impacted soils to the west of Building 4. As discussed below, these borings were originally intended to be risk assessment borings and were analyzed for metals, PAHs, PCBs, pesticides, and VOCs.

Ten risk assessment borings (RA-04SB-01 through RA-04SB-10) were planned for Building 4. Eight were originally located within the footprint of the building and two (RA-04SB-01 and RA-04SB-06) were located outside of the building, just west of the concrete platform located on the west side of the building. The two borings located outside the footprint of the building were changed to be site characterization samples to maintain the consistency of all risk assessment samples for Building 4 being within the building foundation. Therefore, two additional risk assessment borings (RA-04SB-01A and RA-04SB-06A) were added within the footprint of the building, to replace the two that would no longer be used for the risk assessment. Two samples (0 to 0.5 feet and 2 to 3 feet bgs) were collected from borings RA-04SB-01A, RA-04SB-02, RA-04SB-06A, and RA-04SB-07. The remaining borings were to have three samples (0 to 0.5 feet, 4 to 5 feet, and 9 to 10 feet bgs) collected, however, all but one (RA-04SB-03) either met refusal or was located in unstable sand which began collapsing the boring prior to reaching full depth. Borings RA-04SB-04 and RA-04SB-05 each had three samples with the lowest interval at 6 to 6.5 feet bgs. Borings RA-04SB-08 and RA-04SB-10 were stopped with the collection of the 4 to 5 foot bgs sample, and RA-04SB-09 had only the 0 to 0.5 foot bgs sample collected. All risk assessment samples were collected using a stainless steel hand auger and analyzed for metals, PAHs, PCBs, pesticides, and VOCs, except for sample RA-04SB-02(0-0.5)-0902 which the pesticide analysis was inadvertently omitted.

2.4.3 Surface Wipes

Two surface wipe samples (04SW-01 and 04SW-02) were collected from transformer pads in the basement of this building. Both samples were analyzed for PCBs.

During sample layout activities, an oily residue was observed in the bottom of the utility trenches that were located to the north of the air compressor pits. As a result, two additional surface wipe samples (04SW-03 and 04SW-04) were located in these trenches and analyzed for PCBs. These surface wipe samples were co-located with concrete samples 04CS-02 and 04CS-03, respectively.

2.5 BUILDING 5

2.5.1 Mastic

Three mastic samples were collected from Building 5 and analyzed for PCBs. The first sample (05MC-01) was collected on the first floor, outside the elevator doorway. The second sample (05MC-02) was collected from beneath the floor tile inside a former maintenance room on the first floor. The third sample (05MC-03) was collected from mastic remaining on top of the wood flooring in the southern portion of the catwalk that connected Buildings 3 and 5. This catwalk has since been removed as a part of the Building 3 demolition.

2.5.2 Soils

One Geoprobe® soil boring (05SB-01) was located in the former oil storage area at the southwest corner of Building 5. Three samples (0 to 0.5 feet, 4 to 5 feet, and 9 to 10 feet bgs) were collected from this boring for PAH and TPH analyses.

There were sixteen risk assessment borings (RA-05SB-01 through RA-05SB-16) advanced using a stainless steel hand auger within the basement of Building 5. Two samples were collected from each location (0 to 0.5 feet and 2 to 3 feet bgs) and analyzed for explosives, metals, PAHs, PCBs, pesticides, and VOCs.

2.5.3 Surface Wipes

One surface wipe sample (05SW-01) was collected from an oil-stained area in the southeastern corner of the elevator shaft. This sample was analyzed for PCBs.

2.6 BUILDING 6

2.6.1 Mastic

Three mastic samples were collected from Building 6 and analyzed for PCBs. The first sample (06MC-01) was collected from exposed mastic located in the locker room in the second floor catwalk that connected Buildings 3 and 6. This catwalk has since been removed as a part of the Building 3 demolition. The second sample (06MC-02) was collected from beneath floor tile in the hallway just south of the catwalk that connected Buildings 3 and 6. The third sample (06MC-03) was collected on the first floor near the western door on the north side of the building.

2.6.2 Sediment

One sediment sample (06SD-01) was collected from the heating duct found in the hearth room on the first floor of Building 6. This sediment sample was analyzed for metals, SVOCs and VOCs.

2.6.3 Soils

One Geoprobe® soil boring (06SB-01) was located in the former oil storage area at the southeast corner of Building 6. Three samples (0 to 0.5 feet, 4 to 5 feet, and 9 to 10 feet bgs) were collected from this boring for PAH and TPH analyses.

There were fourteen risk assessment borings (RA-06SB-01 through RA-06SB-07 and RA-06SB-09 through RA-06SB-15) advanced using a stainless steel hand auger within the basement of Building 5. Two other locations (RA-06SB-08 and RA-06SB-16) were not sampled because a wall divided the basement and access to the other area could not be found. Two samples were collected from each location (0 to 0.5 feet and 2 to 3 feet bgs) and analyzed for explosives, metals, PAHs, PCBs, pesticides, and VOCs.

2.6.4 Surface Wipes

Five surface wipe samples were collected from this building. One (06SW-01) was collected from inside the heating duct that was found in the hearth room on the first floor of Building 6. This wipe sample was analyzed for VOCs, SVOCs and metals. The other four wipe samples were collected from the underground concrete walkways that connected Buildings 3 and 6 (06SW-02 through 06SW-04) and Building 6 to the SLOP building to the south (06SW-05). These four samples were analyzed for PCBs.

2.7 BUILDING 7

2.7.1 Concrete

One concrete sample (07CS-01) was collected from an oil-stained area on the concrete floor of Building 7 using a hammer drill. This concrete sample was analyzed for TPH.

2.7.2 Sediment

A test pit was excavated within the bounds of the cooling tower foundation – just east of Building 7. A sediment sample (07TD-01) was planned from this pit to characterize the cooling tower blowdown, if present. There was no layer of sediment encountered in this test pit, therefore no sediment sample was collected.

2.7.3 Soils

One boring (07SB-01) was located beneath an area of oil-stained concrete floor inside Building 7. Three samples were collected from this location using a stainless steel hand auger and analyzed for TPH.

Sixteen risk assessment soil borings (RA-07SB-01 through RA-07SB-16) were planned in the area in and around Building 7. Two of the borings (RA-07SB-05 and RA-07SB-09) were located inside the footprint of Building 7 and had to be advanced and sampled at two depths (0 to 0.5 feet and 2 to 3 feet bgs) using stainless steel hand augers. The remaining locations were sampled at three depths (0 to 0.5 feet, 4 to 5 feet, and 9 to 10 feet bgs) using the Geoprobe[®], except RA-07SB-10 which met refusal at 2 feet bgs so only one sample was collected. All samples collected were analyzed for metals, PAHs, PCBs, and VOCs.

Arrowhead collected composite soil samples from the material removed from the test pit excavations for waste characterization. Backfilling of the test pit excavations was postponed until completion of the Contingency Sampling Program (see Section 5.1.2).

2.8 BUILDING 8

2.8.1 Sediment

Two sediment samples were collected from the utility trench that previously contained fuel oil lines. One (08SD-01) was located north of the main doorway on the north side of Building 2 in

the trench from the original location of the tanks and pump building north of Building 2. The other (08SD-02) was located just north of the northeast corner of Building 2 in the trench from the second location of the tanks and pump building east of Building 2. Both samples were collected from the bottom of the trench using stainless steel hand trowels. Neither location contained a significant amount of sediment. Both samples were analyzed for TPH.

2.8.2 Soils

Seven soil borings (08SB-01 through 08SB-07) were advanced along the path of the former pipeline trench that connected the post-1958 fuel oil storage area pump house to Building 2. Excavation along the path revealed that the concrete trench had been removed prior to this investigation. Three samples were collected from each boring using the Geoprobe® rig and analyzed for TPH. One additional boring (08SB-MW02) was advanced adjacent to monitoring well 08MW-02 because impacted soil was observed at this location during well installation. A soil sample was collected from this boring in the impacted area (11 to 13 feet bgs) and analyzed for TPH.

There were twenty risk assessment borings (RA-08SB-01 through RA-08SB-20) advanced within the former oil storage area using the Geoprobe® rig. Three samples were collected from each location (0 to 0.5 feet, 4 to 5 feet, and 9 to 10 feet bgs) and analyzed for metals, PAHs, PCBs, and VOCs. One discretionary sample was collected from boring RA-08SB-15 at 14 to 15 feet bgs due to noticeable petroleum odors from below the 9 to 10 foot sample. This sample will not be used for the HHBRA due to the depth of collection, but will be used in characterizing the site. Due to the odors present in the soil, this sample was analyzed for TPH in addition to the analyses listed above.

Arrowhead collected composite soil samples from the material removed from the test pit excavations for waste characterization. Backfilling of the test pit excavations was postponed until completion of the Contingency Sampling Program (see **Section 5.1.2**).

2.9 BUILDING 10

2.9.1 Soils

Five soil borings (10SB-01 through 10SB-05) were advanced in the vicinity of Building 10, the former underground quench oil storage tank area. Boring 10SB-01 was located within the area of the UST removal. Borings 10SB-02 through 10SB-05 were located outside of the excavated UST removal area to determine if all of the impacted soil had been removed. Two borings, 10SB-01 and 10SB-03, encountered refusal prior to achieving the required depth for sampling, therefore, these borings had to be offset with boring locations 10SB-01A and 10SB-03A, respectively. A discretionary sample was collected from boring 10SB-01 from a thin layer (approximately 4 inches thick) of impacted soil immediately above the refusal point at 15 feet bgs. All samples were collected using the Geoprobe® and analyzed for BTEX (benzene, toluene, ethylbenzene and xylenes) and TPH.

There were no risk assessment sample locations in this investigation area.

2.10 NORTHEAST PARKING AREA**2.10.1 Soils**

Eight Geoprobe® risk assessment borings (RA-NESB-01 through RA-NESB-08) were advanced in the Northeast Parking Area. Three samples (0 to 0.5 feet, 4 to 5 feet, and 9 to 10 feet bgs) were collected from each location and analyzed for metals, PAHs, PCBs, and VOCs.

2.11 RAILROADS**2.11.1 Soils**

Eleven risk assessment soil borings (RA-RRSB-01 through RA-RRSB-11) were advanced at 150 foot intervals along the rail lines on the site using the Geoprobe®. Two other borings (RA-RRSB-12 and RA-RRSB-13) were planned along the rail line leaving the SLAAP site to the south, but access could not be obtained to the adjacent property. Three samples (0 to 0.5 feet, 4 to 5 feet, and 9 to 10 feet bgs) were collected from each location and analyzed for metals, PAHs, PCBs, and VOCs.

2.12 ROADWAYS**2.12.1 Soils**

Sixteen pairs of roadway risk assessment borings (RA-RDSB-01 through RA-RDSB-16 and RA-RDSB-01E through RA-RDSB-16E) were advanced at 150 foot intervals along the site roadways. The borings without an "E" designation were collected from along the center of the roadway and the borings with an "E" designation were collected from the edge of the roadway where runoff was expected. All of these borings were completed using the Geoprobe® rig and samples were analyzed for metals, PAHs, PCBs, and VOCs (four samples located around former Building 9 (RA-RDSB-13, RA-RDSB-13E, RA-RDSB-14, and RA-RDSB-14E) were also analyzed for explosives).

2.13 SEWERS**2.13.1 Survey**

After a preliminary survey of manhole locations and collection of wastewater and sediment samples from the sewer system, the main sewer lines at SLAAP were surveyed with a video camera. These lines were videotaped in order to identify any breaches in the lines that may have historically been conduits for releasing contaminants to the subsurface. The survey consisted of the following:

- 177 linear feet of 6-inch diameter sewer line,
- 2,667 linear feet of 12-inch diameter sewer line,
- 719 linear feet of 15-inch diameter sewer line, and

- 250 linear feet of 18-inch diameter sewer line.

ODESCO Industrial Services, Inc. (ODESCO) completed the sewer survey in accordance with the FSP, with the following exceptions. After assessing the conditions at the site, ODESCO personnel advised that a regular survey camera used in conjunction with ventilation equipment would adequately safeguard against the development of any explosive atmospheres within the sewer system, therefore an explosion-proof camera was not used. Several sections of sewer line were removed or blocked either intentionally with brick and mortar or with hardened sediments and debris. **Figure 2-1** was updated to represent the sewer system as currently exists and to delineate portions of the system that were blocked and not surveyed as dashed lines instead of solid lines.

2.13.2 Sediment

Thirteen sediment samples were identified in the FSP to be collected from the combined (storm/sanitary) sewer system at SLAAP. Eleven of these samples were to be site-wide sediment samples (SRSD-01 through SRSD-11) and two (02SD-01 and 02SD-02) were to be associated with the investigation of Building 2 because available drawings depicted these two manholes inside the building. During site reconnaissance and sample layout activities, it was observed that the two manholes were actually located immediately south of Building 2. Therefore, these locations would be treated as site-wide sediment samples, although the sample nomenclature remained the same.

Sediment was present in only five of the intended thirteen sample locations, therefore the only sediment samples collected were SRSD-02, SRSD-03, SRSD-04, 02SD-01 and 02SD-02. These were analyzed for metals, PCBs, SVOCs, TPH and VOCs (except 02SD-01 and 02SD-02 were not analyzed for SVOCs).

2.13.3 Soils

Thirty-four sewer soil borings (SRSB-01 through SRSB-34) were located adjacent to the sewer lines approximately every 150 feet based on the sewer line survey. Samples were collected using a Geoprobe® rig and analyzed for metals, PCBs, SVOCs, TPH, and VOCs. Starting at the elevation of the sewer line, the FSP directed that three soil samples be collected per boring, at depths of 0 to 0.5 feet, 4 to 5 feet, and 9 to 10 feet below the sewer line. Since all of these samples would be of subsurface soils and the RS60 sampler would be difficult to advance to depth, the first sample interval was increased to one foot to ensure sufficient sample volume from the Macrocore 2" sampler. Due to the depth of the sewers on site, sixteen of the borings met refusal at the soil-bedrock interface prior to attaining sufficient depth for the nine to ten foot sample. For four of these borings, the third sample was collected in the final foot of soil prior to refusal. Nine of these borings met refusal between five and six feet below the sewer line; in these instances, only two samples were collected. Two borings met refusal between three and four feet below the sewer line; in these borings, the second sample was collected in the final foot of soil prior to refusal. Refusal was met in one boring less than one foot below the first sample interval, therefore, no additional samples were collected. The following table summarizes the sample collection from each sewer soil boring:

Samples Collected from Sewer Soil Boring

3 Samples (0-1, 4-5, 9-10)	3 Samples (0-1, 4-5, <9)	2 Samples (0-1, 4-5)	2 Samples (0-1, <4)	One Sample (0-1)
SRSB-05	SRSB-09	SRSB-01	SRSB-10	SRSB-18
SRSB-06	SRSB-12	SRSB-02*	SRSB-20	
SRSB-07	SRSB-27	SRSB-03		
SRSB-08	SRSB-27	SRSB-04		
SRSB-15		SRSB-11		
SRSB-16		SRSB-13		
SRSB-19		SRSB-14		
SRSB-21		SRSB-17		
SRSB-22		SRSB-28		
SRSB-23				
SRSB-24				
SRSB-25				
SRSB-26				
SRSB-29				
SRSB-30				
SRSB-31		* second sample		
SRSB-32		was collected		
SRSB-33		from 5 to 6 feet		

2.13.4 Wastewater

Thirteen wastewater samples were identified in the FSP to be collected from the combined (storm/sanitary) sewer system at SLAAP. Eleven of these samples were to be site-wide wastewater samples (SRWW-01 through SRWW-11) and two (02WW-01 and 02WW-02) were to be associated with the investigation of Building 2 because available drawings depicted these two manholes inside the building. During site reconnaissance and sample layout activities, it was observed that the two manholes were actually located immediately south of Building 2. Therefore, these locations would be treated as site-wide sediment samples, although the sample nomenclature remained the same.

Wastewater was present in all but three of the intended thirteen sample locations, therefore wastewater samples SRWW-05, SRWW-08, and SRWW-09 were not collected. The collected samples were analyzed for metals, PCBs, SVOCs, TPH and VOCs (02WW-01 and 02WW-02 were not analyzed for SVOCs).

2.14 GROUNDWATER

Four new groundwater monitoring wells were installed by Aquadrill, Inc. with a cable-tool equipped drill rig in the overburden materials on the site. Three of these wells (08MW-01, 08MW-02 and 08MW-03) were associated with Building 8 and one well (03MW-01) was associated with Building 3. The bottom of each of these wells was placed on top of the shale bedrock. These wells were installed in accordance with the FSP, with the following exceptions. Three of the four monitoring wells were installed with ten-foot long screens instead of five-foot long screens specified in the FSP because no obvious water-bearing unit encountered during drilling, and the well would be more likely to get water from the formation with longer screens. The fourth well (03MW-01) was not deep enough to accommodate a ten-foot screen, so only a

seven-foot screen was installed. The other change in well installation procedures was bentonite chips were used to seal the boreholes instead of cement bentonite grout specified in the FSP. The State of Missouri approved this change, since their regulations allow this procedure.

The four new monitoring wells were developed using both a Grundfos pump and disposable bailers. The wells were surged, in some cases with de-ionized water added to the well for sufficient volume, and purged dry. Since these four wells did not recharge quickly, they were not purged again prior to sampling the following week. The EPA and MDNR Project Managers approved this change to the FSP because drawdown in these wells never stabilized.

Nine existing on-site wells (02MW-01, 10MW-01, and SWMW-01 through SWMW-07) are also present on site and were sampled as part of the August/September 2002 field activities. Sampling at each of these wells was attempted using low-flow techniques with a Fultz pump. However, every well displayed excessive drawdown during pumping, even at rates less than 0.5 liters (L)/minute, to allow proper low-flow sampling. Therefore, each well was pumped dry and allowed to recover for 24 hours before sampling with disposable hand bailers.

Water levels were measured from all thirteen wells at various times throughout the August/September 2002 sampling event. The results of these measurements as well as ground surface elevation and top-of-casing elevations and the calculated groundwater elevations are presented in **Table 2-3**. Groundwater samples were collected from all thirteen wells and analyzed for explosives, metals, nitrates, PAHs, PCBs, pesticides, phosphorus, SVOCs, and VOCs. Field test strips were added to the analyses to quantify total alkalinity, total hardness, free chlorine and total chlorine at all thirteen wells and one fire hydrant (east of Building 2 and south of Building 11). Also, samples from 03MW-01, 08MW-03 and 08MW-02 and the fire hydrant were analyzed for chloride and fluoride. These additional analyses were added, after observing leakage from the hydrant, to characterize the drinking water supply and compare it to the water found in the nearby wells.

2.15 REGIONAL BACKGROUND

2.15.1 Soils

Ten surface soil samples were collected from local municipal parks. The sample results were used to calculate regional background levels of metals and PAHs. Five of these samples were collected from Penrose Park, located just south of I-70 on both sides of North Kingshighway Boulevard, approximately 1.3 miles southeast of SLAAP. According to St. Louis City Parks Commissioner, Mr. Dan Skillman, Penrose Park has been owned and operated as a park by the City since 1910. He did not know of any previous industrial activity at this location. He did mention that an underground diesel fuel storage tank had been located near a maintenance shed in the park, however none of the five samples were located near the maintenance shed.

The other five samples were collected from Dwight Davis Park, located north of I-70 and east of Riverview Boulevard between Lillian and Theodore Avenues, approximately 0.4 miles east-northeast of SLAAP. According to Mr. Skillman, this park has been owned and operated by the City since 1951. Since it was possible that industrial facilities could have been present on this property prior to 1951, a 1931 Sanborn map of the park area was reviewed. The entire area of the park was either residences or open lots in 1931. A gas station with three aboveground

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Site-Specific Investigations

storage tanks was indicated on the Sanborn map just north of the park, at the southeast corner of Riverview and Theodore. This gas station was not within the park boundaries and no samples were collected from this area.

3.1 TOPOGRAPHY

SLAAP is located in the southern portion of the Dissected Till Plains Section of the Central Lowland Province. The topography of this area consists of rolling uplands with slopes of 2 to 5 percent, and an elevation range of 500 to 550 feet above mean sea level (msl) sloping gently to the south within a 2-mile radius of the SLAAP property (Environmental Data Resources, Inc. (EDR), 1999). As reported in the *Installation Assessment of St. Louis Army Ammunition Plant*, the SLAAP property is bounded on the north by Interstate 70, on the west by Goodfellow Boulevard, on the south by PURO Chemical Division (PURO) (located in a portion of the former SLOP site) (PURO has since been replaced by Triad Manufacturing, Inc.), and on the east by Riverview Boulevard (USATHMA, 1979).

3.2 GEOLOGY

The geology of the SLAAP property, based on the Comprehensive EBS Report (TTEMI, 2000) and SSEBS field investigations in August and September 2002, generally consists of silty clay, clayey silt, cherty gravel, and fill overlying Pennsylvanian age weathered shale. Underlying the shale is the Mississippian age St. Genevieve limestone.

Fill consisting of a thin layer of gravel (typically one foot thick) is typically present underneath asphalt and concrete. Underneath the gravel layer are overburden materials ranging from light brown, medium stiff, low plastic silty clay or clayey silt to stiff, high plastic clay. In several borings, this material was logged as fill as it appeared to be reworked native material. This material is reportedly loess and may have been derived from the Missouri River Flood Plain during the Pleistocene Epoch approximately 2 million years ago (USAEHA, 1993). The thickness of the silty clay deposits overlying the shale range from approximately 14 to 26 feet.

Weathered shale was encountered in 10 of 13 monitoring well borings and eight soil borings completed during the Comprehensive EBS and SSEBS investigations at depths ranging from 12 to 31.9 feet bgs. All of the monitoring well and soil borings were terminated prior to reaching the bottom of the shale unit. The maximum thickness of weathered shale encountered in these borings is 15 feet. A soil boring drilled in 1971 at SLAAP encountered a medium-hard, medium- to fine-grained limestone (St. Genevieve limestone) at 65 feet bgs (TTEMI, 2000). The thickness of the shale unit encountered in this boring is not known. The bedrock units beneath the site are reportedly flat lying.

3.3 HYDROGEOLOGY

Bedrock units in and around St. Louis are capable of yielding varying amounts of groundwater. Well yield depends on site-specific geologic and well characteristics. Most wells in the St. Louis area yield a maximum of 50 gallons per minute from depths down to 800 feet bgs (USATHMA, 1979). These wells are screened in limestones and sandstones ranging in age from Mississippian to Ordovician. Water yields of up to 1,955 gallons per minute (gpm) can be expected from wells drilled in thick alluvial deposits that contain little silt or clay-like material. However, no potable water wells are reported to exist within 3 miles down gradient of SLAAP (USAEHA, 1993).

Regional groundwater flow in the SLAAP area is north-northeast toward the Mississippi River. The runoff in St. Louis County discharges to the Missouri River to the north, the Mississippi River to the east, and the Meramec River to the south.

3.4 CLIMATOLOGY/METEOROLOGY

Average annual precipitation is about 36 inches with the wettest period (about 10.5 inches) between March and May in the form of showers and thunderstorms. Snowfall averages 18 inches annually. January is the coldest month with an average low temperature of 20°F. July is the warmest month with an average high temperature of 89°F.

3.5 HYDROLOGY

No surface water is present on the SLAAP property. Storm water on the property is collected by catch basins that discharge to the St. Louis Metropolitan Sewer District combined sewer system.

3.6 ECOLOGY

Biology

Except for small grassy areas, buildings and asphalt cover the SLAAP property. Most vegetative growth on the site is volunteer weeds and small trees. The site serves as a habitat for a variety of insects and occasional mammals (opossum, raccoon, etc.) typical of empty property/buildings in an urban area.

Endangered Species

Except for small grassy areas, buildings and asphalt cover the SLAAP property. The closest body of water, the Mississippi River, is located about 3 miles from the property. No endangered or threatened species have been identified on the property. According to the Missouri Department of Conservation, the transfer, outgrant, or disposal of the SLAAP property will not impact any endangered species or cause sensitive environment concerns in the vicinity of the property (Missouri Department of Conservation, 1993).

Wetlands

A 1994 National Wetlands Inventory map of the area within 2 miles of SLAAP was reviewed to identify surface water bodies and wetlands. According to the map, the closest wetland is approximately 1.4 miles east of SLAAP, and another wetland lies approximately 1.5 miles northwest of SLAAP. No wetlands were identified on the SLAAP property or in its immediate vicinity (EDR, 1999).

3.7 SITE LAND USE***General***

SLAAP is located along I-70 within the boundaries of St. Louis, Missouri. The surrounding area is comprised of a mixture of residential, commercial and light industrial applications.

Archeology

SLAAP is located across the Mississippi River from the American Bottoms archeological region. In 1985, an archeological overview and management plan was prepared for SLAAP. According to the plan, no known or identifiable potential archeological sites are located on the SLAAP property. Most of the SLAAP property is asphalt-paved or covered by structures; therefore, some type of ground disturbance has impacted most of it. It is doubtful that any surficial archeological sites remain on the SLAAP property. However, the existence of subsurface archeological deposits is possible (Woodward-Clyde Consultants, 1985).

A letter from the MDNR Division of State Parks dated June 21, 1994 indicates that none of the SLAAP structures are eligible for inclusion on the National Registry of Historic Places (MDNR, 1994).

SECTION FOUR

Results of August/September 2002 Sampling Activities

4.1 SAMPLE IDENTIFICATION SYSTEM

All samples collected during the August/September 2002 sampling event were assigned a unique field sample ID which identifies the sample as follows.

RA-AA XX - NN (UU-LL) - MMY - QQ

Each element of the sample ID represents the following identifying information:

RA-: Designates a Risk Assessment sample, not present for Site Characterization samples

AA: Two-character code representing the Investigation Area:

##	Building # (i.e. 01 is Building 1, 02 is Building 2, etc.)
NE	Northeast Parking Area
RR	Railroad
RD	Roadway
SR	Sewer system
BK	Regional Background
SW	Site-Wide (for Monitoring Wells only)

XX: Two-character code representing the sample media type:

AC	ACM
CS	Concrete
MC	Mastic
MW	Monitoring Well (Groundwater)
PD	Product
SB	Soil Boring
SD	Sediment
SW	Surface Wipe
TS	Test Pit Soil Boring
WW	Wastewater

NN: Two-digit sequential sample number for Investigation Area and sample media type (i.e. 01 is the 1st sample of a given media type collected within a given Investigation Area, 02 is the 2nd sample, etc.) Offset borings due to refusal were indicated with an "A" designation after the sample number (i.e. -01A). Contingency samples will be designated with sequential letters appended to the original sample location number as well.

(UU-LL): Depth interval (used for Concrete and Soil Borings only)

UU Upper depth of sample collection interval

LL Lower depth of sample collection interval

i.e. (09-10) indicates the sample was collected between 9 and 10 ft bgs

MMYY: Month and Year sample was collected.

QQ: Additional characters added by the analyzing laboratory to uniquely identify the sample results from multiple analyses of one original sample

RE Re-analysis of the original sample

RE-DIL Re-analysis of a dilution of the original sample

SECTION FOUR

Results of August/September 2002 Sampling Activities

Site Characterization Sample ID Examples

RA-04SB-06(04-05)-0802	Sample collected from the 6 th risk assessment soil boring in Building 4 from the 4 to 5 foot depth interval during August 2002
01SB-03(05-06)-0802	Sample collected from the 3 rd site characterization soil boring in Building 1 from the 5 to 6 foot depth interval during August 2002
SRSD-15-0802	15 th sediment sample collected from the sewers in August 2002
02CS-02(0-0.1)-0802	2 nd concrete sample collected in Building 2 from the 0 to 1 inch depth interval in August 2002

4.2 SCREENING LEVELS

The regulatory guidelines used to establish the screening level for each compound were the EPA Region IX Residential PRGs and MDNR CALM Scenario A contaminant levels, which are based on residential exposures. The selection of residential exposure limits was made not because future residential uses are anticipated, but rather to determine the detection limits that allow for maximum flexibility in the decision making process. For compounds where the PRGs and CALM levels are not the same, the more conservative (lower) value was used for establishing the screening level.

For metals and PAHs, background levels for the region were established by collecting ten regional background samples from two area municipal parks (Davis and Penrose). Reasonable background areas were selected from undeveloped regions of similar soil types and approved by EPA Region VII and the Missouri Department of Health and Senior Services (MDHSS). Results from the background samples were used to calculate a value for the regional background contaminant level. The regional background contaminant level was taken to be the 95% upper tolerance limit for 95% of observations, but this value was calculated only after examination of the background data and removal of data points which were considered to be outliers (Hogg, 1987). The determination of which data points were outliers was made with Dixon's Extreme Value Test and the data determined not to be outliers were confirmed to be normally distributed by the Studentized Range Test (EPA, 1998b). Non-detect values were taken to be one-half of the reporting limit unless the laboratory consistently reported estimated detections an order of magnitude or greater below the reporting limit, in which case the non-detect values were excluded. For analytes where most data points were excluded or non-detect, no background levels were calculated. Screening levels for metals and PAHs were established as the background level if the statistically determined background level was greater than the PRG and CALM.

Tables 4-1 and 4-2 provide the PRG, CALM, and background values and final Screening Level for all compounds for both soil and water, respectively. Screening levels for concrete and sediment are not available; therefore, results for these media were compared to the soil screening levels. Groundwater and wastewater sample results were compared to the water screening levels. The PRG and CALM values were not developed for evaluating wastewater quality and therefore serve as a very conservative screening level for the wastewater found in the SLAAP sewer system. Mastic, product and surface wipe sample results are compared against the definition for PCB-contaminated media in 40 CFR Part 761.3 in Table 4-3 (EPA, 1998a).

4.3 RESULTS

Analytical results above the established screening levels are shown in **Tables 4-4 through 4-21**.

Tables 4-4 through 4-7 provide results for various sample media types. Soil sample results for each investigation area are provided in **Tables 4-8 through 4-17** and **4-19**. Sewer sediment and wastewater sample results are provided in **Tables 4-18** and **4-20**, respectively. Results from the thirteen on-site monitoring wells are provided in **Table 4-21**. Regional background soil sample results used to calculate background screening values are reported in **Appendix A, Table A-10**.

5.1 ADDITIONAL INVESTIGATION ACTIVITIES

5.1.1 Other Completed Investigation Activities

Building 3 was investigated by Arrowhead under Contract No. DACW41-00-D0019, Task Order No. 0002 with CENWK. Contaminated soils were removed along with the building structure during 2002. Results from this April 2002 sampling event and removal of the impacted soils will be addressed in the SSEBS and HHBRA.

5.1.2 Contingency Sampling Program

A Contingency Sampling Program has been prepared in accordance with the FSP to address areas that were not fully characterized during the initial August/September sampling event and describes the specific site characterization requirements set forth in the FSP for the SSEBS at SLAAP. The general requirements for the contingency sampling are described in Sections 3.1.4 and 3.1.5. This program incorporates, by reference, all protocols and procedures described in the FSP. Some minor modifications to the FSP within this contingency sampling program are described below:

- Beryllium detections above the screening level were observed in several locations across the site, typically in native clays deeper than 10 ft. below ground surface (bgs). Anecdotal information suggests that beryllium may be a naturally occurring constituent of the clay at concentrations found in the site clays and is not considered to be a site-related contaminant. Background samples were collected from topsoil (0-0.5 ft bgs) and are not representative of the deeper clay materials found at the site. Furthermore, there is no exposure pathway in deep soils, making additional data unnecessary for the SSEBS or HHBRA. For these reasons, contingency samples are not required to address this metal.
- Copper was detected at one location (RA-01SB-03) above the screening level at 0-0.5 ft bgs in the parking area west of Building 1, within the former billet storage yard. Since other borings within the former billet storage yard to the north, east and west of RA-01SB-03 did not have levels of copper above the screening level, only one additional boring to the south is necessary to define the extent of contamination. However this southern boring would be outside the storage yard and process knowledge does not indicate that metals were ever stored outside the yard, therefore installation of this boring is not required.
- Lead was detected above the screening level at one location at 0-0.5 ft bgs in the open grassy area south of the former cooling tower (RA-07SB-15). Since other borings within this area to the north, east and west did not have levels of lead above the screening level, only one additional boring would be necessary to define the extent of contamination. However, the southern boundary of the site is only approximately fifteen feet from RA-07SB-15 that defines the extent of contamination on the site in this direction. Therefore, no additional samples are required.
- PAHs were detected above the screening levels in the following locations:
 - RA-01SB-03 and RA-01SB-04 in the 0-0.5 ft bgs samples
 - RA-04SB-01 in the 0-0.5 ft bgs sample

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Additional Investigation and Reporting Activities

- 05SB-01 in the 9-10 ft bgs sample
- RA-07SB-01, -02, -03, -04, -06, -07, and -08 in the 0-0.5 ft bgs samples
- RA-08SB-06 and RA-08SB-07 in the 4-5 ft bgs samples

Additional investigation is not required for these locations because the extent of contamination has been fully defined by other samples and site features.

- An additional round of groundwater levels will be taken to aid in interpreting the potentiometric surface and analyzing potential exposure pathways for certain risk assessment scenarios.
- One sewer sediment sample (SRSD-03) will be re-collected and analyzed for PCBs and dioxins to characterize potential dioxin releases to the sewer system from Building 2.

Based on the sampling investigation results and the FSP, contingency activities will be performed in the following Investigation Areas. The contingency sample locations are depicted on **Figure 5-1** and a summary of all samples to be collected with corresponding analyses is provided in **Table 5-1**.

Building 1

Three additional 0-0.5 ft bgs samples will be collected to define the extent of PCBs detected above the screening level at 01SB-10. Sample location 01SB-11 defines the eastern boundary, and samples from borings 01SB-10A, -10B, and -10C will be analyzed for PCBs.

One additional boring (01SB-15A, to be co-located with sewer soil boring SRSB-39) will be sampled to define the extent of arsenic detected above the screening level at 01SB-15. Sample locations RA-01SB-08, RA-01SB-09 and RA-RRSB-07 define the northern, eastern and western boundaries. One sample from 0-0.5 ft bgs will be collected from boring 01SB-15A and analyzed for arsenic.

Building 2

Due to the detection of dioxins and PCBs in Building 2, ten additional soil borings will be advanced around the perimeter of the building to evaluate the nature and extent of these contaminants. These sample locations (02SB-10 through 02SB-19) will have three sample depths (0-0.5, 4-5, and 9-10 ft bgs) and will be analyzed for PCBs and dioxins. Samples from 02SB-10 and RA-RDSB-02A will be co-located within one boring.

Building 4

PCBs were detected above the screening level at two concrete sample locations (04CS-02 and 04CS-03) in compressor pits. Two soil borings (04SB-04 and 04SB-05) will be advanced, sampled at two intervals (0-0.5 and 2-3 ft bgs) and analyzed for PCBs.

PAHs were detected above the screening level at two soil boring locations (RA-04SB-06 and RA-04SB-08). One additional boring (RA-04SB-06B) will be located across the roadway west of RA-04SB-06 and sampled at 0-0.5 ft bgs. Another boring (RA-04SB-08A) will be located

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south of RA-04SB-08 and outside of Building 4 and will be sampled at 4-5 ft bgs. Both samples will be analyzed for PAHs.

Building 6

Several soil samples in the basement of Building 6 had detections of mercury and 4,4'-DDT above the screening levels. While most of these detections were in surface samples surrounded by other samples that were not above the screening level, one sample (RA-06SB-04) was from 2-3 ft bgs and therefore this zone is not vertically defined. One additional sample will be collected from 4-5 ft bgs at this location (RA-06SB-04A) and analyzed for mercury and 4,4'-DDT.

Building 7

PCBs were detected above the screening level at one location (RA-07SB-02) in the surface sample adjacent to Building 7. Samples below the screening level were located east, south and west of this sample, so only the north extent requires further characterization. One surface sample (RA-07SB-02A) will be collected from the same boring as sewer soil samples SRSB-41 under the roadway north of Building 7 and analyzed for PCBs.

Building 8

Total Petroleum Hydrocarbons - Diesel Range Organics (TPH-DRO) were detected above the screening level in sample 08SB-07 at 7-8 ft bgs. With 08SB-06 defining the northern extent and RA-08SB-09 defining the western extent, two additional borings (08SB-07A, and 08SB-07B) will be advanced south and east of 08SB-07 and analyzed for TPH-DRO in the 7-8 ft bgs depth interval.

1,1-Dichloroethene (1,1-DCE) was detected near Building 8 at RA-08SB-05 in the surface sample. Since RA-08SB-01, -06, and -09 define the northern, eastern, and southern extents, respectively, one additional boring (RA-08SB-05A) will be advanced west of RA-08SB-05 and a surface sample will be analyzed for 1,1-DCE.

PAHs were detected above the screening level at location RA-08SB-16 in the 4-5 ft bgs sample. RA-08SB-12, RA-08SB-15, and RA-08SB-20 bound this location to the north, west, and south, respectively. The eastern extent will be estimated by collecting a 4-5 ft bgs sample from RA-08SB-16A and analyzed for PAHs. Samples from RA-08SB-16A and RA-NESB-01A will be co-located within one boring.

Building 10

All Building 10 samples specified in the FSP were collected and the results were all below the screening level for TPH-DRO. However, samples taken from deeper than 10 ft bgs in nearby sewer borings had detections above the screening level. Therefore, four new borings (10SB-06 through 10SB-09) will be advanced to a depth of approximately 20 feet in the vicinity of the four borings that were stopped at 10 ft bgs.

Since detections at the previous locations (SRSB-18 and SRSB-19) were in the 14-15 ft bgs depth interval, samples will be collected from this depth, as well as any other intervals showing signs of contamination, and analyzed for TPH-DRO.

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Also, the 6-7 ft bgs sample at SRSB-16 to the northeast of Building 10 was above the screening level for TPH-DRO. Four additional borings (SRSB-16A, -16B, -16C, and -16D) will be advanced to a depth of approximately 12 feet, with samples collected from 6-7 ft bgs and any other interval showing signs of contamination, and analyzed for TPH-DRO.

Northeast Parking Area

PAHs were detected above the screening level in the 0-0.5 ft bgs sample at location RA-NESB-01. Adjacent samples determine all but the eastern extent, therefore, one additional boring (RA-NESB-01A) will be sampled from 0-0.5 ft bgs and analyzed for PAHs. Samples from RA-08SB-16A and RA-NESB-01A will be co-located within one boring.

Railroads

Sample RA-RRSB-10(0-0.5)-0802 had the only detection along the railroads above the screening level for 1,1-DCE. Since this location is relatively remote from other borings, surface samples from four additional borings (RA-RRSB-10A, -10B, -10C, and -10D) will be collected and analyzed for 1,1-DCE.

Roadways

1,1-DCE was detected above the screening level at RA-RDSB-01E in the 9-10 ft bgs sample. Since RA-RDSB-01 defines the southern extent and the property boundary with a retaining wall and drop off to I-70 defines the northern extent, two additional borings (RA-RDSB-01EA and -01EB) will be advanced and analyzed for 1,1-DCE in the 9-10 ft bgs depth interval.

PAHs were detected above the screening level at RA-RDSB-02 in the 9-10 ft bgs sample. Since RA-RDSB-02E and the property boundary define the northern and eastern extents, two additional samples will be collected and analyzed for PAHs in the 9-10 ft bgs depth interval. The southern sample will be collected from boring RA-RDSB-02A and the western sample will be collected from boring RA-RDSB-02B. Samples from RA-RDSB-02A and 02SB-10 will be co-located within one boring.

Antimony was detected above the screening level in the surface sample at RA-RDSB-16E. With RA-RDSB-16 defining one direction, surface samples from three additional borings (RA-RDSB-16EA, -16EB, and -16EC) will be collected and analyzed for antimony.

Sewers

Sewer soil boring location SRSB-30 had PAHs detected above the screening level in the 3-4 ft bgs sample. This location is bounded to the north by RA-RDSB-05 and to the east by the Building 3 demolition/removal area. Therefore, two additional locations (SRSB-30A and SRSB-30B) are required to define the southern and western extents. These samples will be collected in the 3-4 ft bgs interval and analyzed for PAHs.

Sediment and wastewater samples collected from manholes had detections above the screening levels for metals, PCBs, SVOCs, and VOCs. Soil borings to characterize the potential for releases of these contaminants from breaches in the sewer lines will be advanced within

approximately 25 feet of each identified breach location not already characterized by an initial sewer soil boring (SRSB-01 through SRSB-34). Ten such locations have been identified and labeled SRSB-35 through SRSB-44. Three samples will be collected at each location (at the sewer line depth, 4 to 5 feet below the sewer line, and 9 to 10 feet below the sewer line). All samples will be analyzed for metals, PCBs, SVOCs, TPH and VOCs. If bedrock is encountered at a depth less than ten feet below the sewer line, the next sample interval will be moved up to one-foot above refusal. Samples from SRSB-39 and SRSB-41 will be co-located with samples from 01SB-15A and RA-07SB-02A, respectively, within one boring.

5.2 ADDITIONAL REPORTING ACTIVITIES

5.2.1 Site-Specific Environmental Baseline Survey

The data presented in this IDR, the investigation and demolition/remediation of Building 3 and the Contingency Sampling Program will be included in the SSEBS. The nature and extent of the contamination will also be analyzed and documented in this report. The SSEBS will be completed and submitted under separate cover after review and evaluation of the data presented in this IDR and the data collected for the Contingency Sampling Program.

5.2.2 Human Health Baseline Risk Assessment

All data incorporated in the SSEBS will be evaluated to estimate the level of risk posed to human health by any contamination present at SLAAP. The HHBRA will be completed and submitted under separate cover after completion of the SSEBS.

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Table 1-1. Summary of Comprehensive Environmental Baseline Survey Results

Location	Areas of Environmental Concern	Recommendations
Sitewide	ACM	Manage ACM in accordance with Asbestos Hazard Emergency Response Act (AHERA) regulations or requirements
	LBP	Complete LBP assessments and handle accordingly
	Fluorescent light ballast potentially containing PCBs	Remove and dispose of ballasts
Building 1	PCB oil-containing electrical equipment	Remove equipment
	PCB oil stain	Decontaminate stained area
	Metal-contaminated soil in east storage area and near sewer connections	Assess extent of metal contamination and evaluate remediation alternatives
Building 2	Metal-contaminated surface soil	Characterize and remove soil
	Metal-contaminated sump water	Characterize and remove water
	Chlorinated solvents-contaminated groundwater	Extent of contamination was assessed through interpretation of results from groundwater monitoring wells and no further characterization appears warranted
	Potential PCB contamination at former hydraulic oil storage tank area	Evaluate if additional characterization is warranted
Building 3	PCB-contaminated concrete floor in basement	Evaluate and implement appropriate remediation
	PCB-contaminated soil at basement earthen soil	Characterize and remove
	PCB-contaminated concrete and brick walls in basement and first-floor chip chute areas	Evaluate and implement appropriate remediation
	Various equipment in basement	Characterize and remove materials and equipment
	Airborne pesticides detected in basement	Evaluate and implement appropriate remediation
	Cracked and peeling paint and cracked concrete floor	Evaluate in conjunction with future use of property
	Semivolatile organic compound (SVOC) and PCB-contaminated soil underneath north loading dock	Assess and remediate soil
	PCB-contaminated drain and sump water	Characterize and remove water
	PCB-contaminated elevator equipment and oil stains in penthouses	Decontaminate or remove equipment or stains
Building 4	PCB oil-containing electrical equipment	Remove equipment
	PCB oil stain under electrical equipment	Decontaminate stained area
	PCB oil-stained transformer pad	Decontaminate stained area
	PCB-contaminated material in air compressor pits	Characterize and remove material
	SVOC-contaminated soil	SVOC contamination appears to be background condition and no further characterization appears warranted

Tables

Location	Areas of Environmental Concern	Recommendations
Building 5	PCB-contaminated elevator equipment and oil stains in penthouse	Decontaminate or remove equipment and stains
	SVOC-contaminated soil	SVOC contamination may be associated with former SLOP oil storage building
Building 6	Metal-contaminated ash in hearth	Characterize and remove ash
	SVOC-contaminated soil	SVOC contamination may be associated with former SLOP oil storage building
Building 7	No areas of environmental concern	No further characterization appears warranted
Building 8 and 8A	SVOC contaminated soil with extent assessed	Extent of SVOC contamination assessed and no further characterization appears warranted
Buildings 9 and 9a through 9D	No areas of concern	No further characterization appears warranted
Building 10	Leaking UST incident extent assessed	No further characterization appears warranted; MDNR to provide guidance to close UST
Building 11, 11A, and 11B	No areas of concern	No further characterization appears warranted

